Agilent 4284A
Precision LCR Meter

Service Manual

MANUAL IDENTIFICATION

Model Number: 4284A
Date Printed: July 2000
Part Number: 04284-90100

This supplement contains information for correcting manual errors and for adapting the manual to newer instruments that contains improvements or modifications not documented in the existing manual.

To use this supplement
1. Make all ERRATA corrections
2. Make all appropriate serial-number-related changes listed below

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES
All	1

◇New Item

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES

ERRATA

Change	Page	Note	Reference Designator	HP Part Number	Description
1	3-6	►A		04284-60001	Inner Frame
	4-A7-3	►A	A7U11	1818-5719	IC CMOS 64K EEPROM
			A7U12	1818-5719	IC CMOS 64K EEPROM
			A7U23	1818-5719	IC CMOS 64K EEPROM
			A7U24	1818-5719	IC CMOS 64K EEPROM
	4-A20-2	►C	A20C1	0180-4403	CAPACITOR-FXD 470UF

►: New Item C: Change D: Delete A: Add

NOTE

Manual change supplement are revised as often as necessary to keep manuals as current and accurate as possible. Agilent Technologies recommends that you periodically request the latest edition of this supplement. Free copies are available from all Agilent Technologies offices. When requesting copies, quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

PRINTED IN JAPAN

Agilent Technologies

MANUAL CHANGES

HP 4284A

Precision LCR Meter

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To use this supplement
1. **Make all ERRATA corrections**
2. **Make all appropriate serial-number-related changes listed below**

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES
2940J01172 and above	1
2848J00388 and above	2

SERIAL PREFIX OR NUMBER	MAKE MANUAL CHANGES

► **New Item**

► ERRATA

Page 3-3, Figure 3-1. Assembly Identification (1/2):

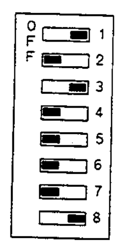
Exchange the assembly labels A40 and A50.
(In HP 4284A, A40 is on the right of A50)

Page 3-14, Table 3-7. Rear Panel Components:

See Parts Information Table at the end of this supplement.

Page 3-37, Table 3-12. Bit Switch Selected Self Test:

Correct Bit Switch No. 5 setting as shown next.



No.5

NOTE

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▶ CHANGE 1

Page 1-A30-4, Table 1-46. A30 Handler Interface Replaceable Parts List:

See the Parts Information Table at the end of this supplement.

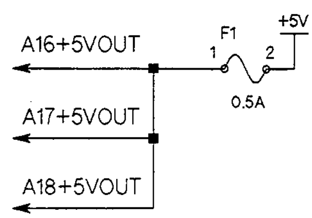
Page 1-A30-5, Figure 1-44. A30 Handler Interface Component Locations:

Replace the component locations with Figure 1

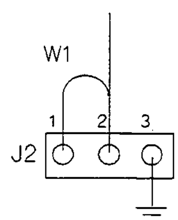
Page 1-A30-5, Figure 1-45. A30 Handler Interface Schematic Diagram:

Partially change the schematic diagram as described next.

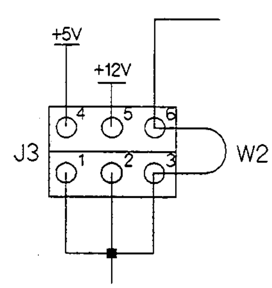
- Rename F1 to F2.
- Add F1 to the +5V line as shown next.



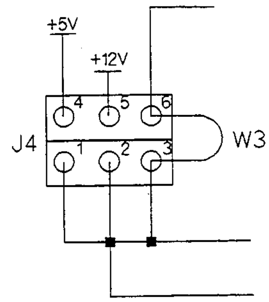
- Replace W1 with J2 and W1 as shown next.



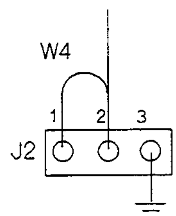
- Replace W2, W3, and W4 with J3 and W2 as shown next.



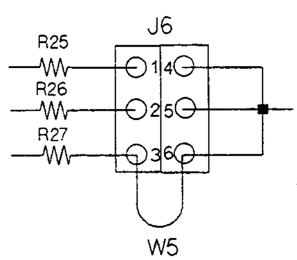
• Replace W5, W6, and W7 with J4 and W3 as shown next.



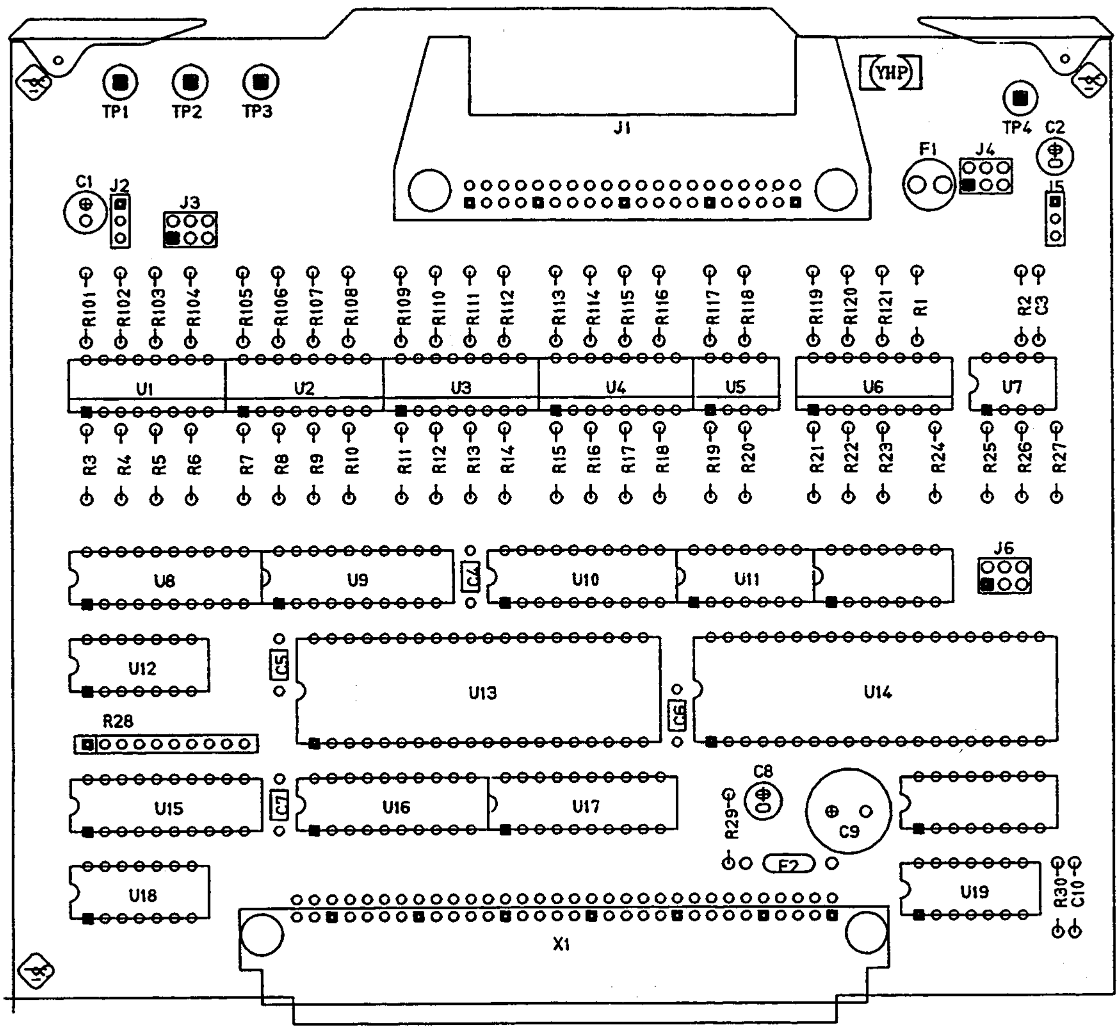
• Replace W8 with J5 and W4 as shown next.



• Replace W9, W10, and W11 with J6 and W5 as shown next.



A30J1A	Pin No.	A30J1B
nc	20	nc
nc	19	nc
+5V	18	EXT.DCV1_COM
+5V	17	EXT.DCV1_COM
+5V	16	EXT.DCV1_COM
EXT.DCV2	15	EXT.DCV2_COM
EXT.DCV2	14	EXT.DCV2_COM
/EXT_TRIG	13	/EOM
/EXT_TRIG	12	/INDEX
/AUX_BIN	11	/ALARM
OUT_OF_BINS	10	EXT.DCV1
/BIN9	9	EXT.DCV1
/BIN8	8	nc
/BIN7	7	/KEYLOCK
/BIN6	6	/UNBAL
/BIN5	5	nc
/BIN4	4	nc
/BIN3	3	/SREJ
/BIN2	2	/PLO
/BIN1	1	/PHI



A30X1B	Pin No.	A30X1A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5V	4	+5V
+5V	5	+5V
+5V	6	+5V
+12V	7	+12V
LGND	8	LGND
nc	9	nc
nc	10	nc
nc	11	nc
nc	12	nc
nc	13	nc
nc	14	nc
nc	15	nc
/HANDLER	16	A1
LGND	17	LGND
D14	18	D15
D12	19	D13
D10	20	D11
D8	21	D9
D6	22	D7
D4	23	D5
D2	24	D3
D0	25	D1
LGND	26	/POW_FAIL
/VPA	27	/VMA
/RESET	28	E
R/W	29	LGND
/UDS	30	/LDS
/KEY_LOCK_INT	31	/HDL_TRG_INT
nc	32	LGND

Figure 1. A30 Handler Interface Component Locations

► CHANGE 2

Page 4-A7-3, Table 4-A7-2. A7 Digital Control Replaceable Parts Lists (4/4)

Change the version number to 1.11.

See Parts Information Table at the end of this supplement.

Table 1. Parts Information

CHANGE	PAGE	Note	Reference Designator	HP Part Number	Description
ERRATA	3-14	►D	6 (OPT002)	04284-00210	I/F Plate
		►D		04284-61610	Flat Cable Assembly
		►D		0515-1551	Screw for Connector
		►D		0535-0031	Nut
		►D		0515-1550	Screw for Plate
		►D		7120-0382	Label
		►A	6 (OPT002)	04284-61615	Cable Assembly
1	1-A40-4	►C	A30	04278-66532	#201 HANDLER IF
		►D	A30F1	2110-0741	FUSE 1A 125V
		►A	A30F1	2110-0046	FUSE 0.5A 125V
		►A	A30F2	2110-0741	FUSE 1A 125V
		►A	A30J2	1251-4822	CONN-POST-TP-HDR
		►A	A30J3	1251-8736	CONN-POST-TP-HDR
		►A	A30J4	1251-8736	CONN-POST-TP-HDR
		►A	A30J5	1251-4822	CONN-POST-TP-HDR
		►A	A30J6	1251-8736	CONN-POST-TP-HDR
		►D	A30W4	8159-0005	RESISTOR-ZERO OHMS
		►D	A30W7	8159-0005	RESISTOR-ZERO OHMS
		►D	A30W11	8159-0005	RESISTOR-ZERO OHMS
		►A	A30W1	1258-0141	JUMPER-REM
		►A	A30W2	1258-0141	JUMPER-REM
		►A	A30W3	1258-0141	JUMPER-REM
		►A	A30W4	1258-0141	JUMPER-REM
		►A	A30W5	1258-0141	JUMPER-REM
2	4-A7-3	►C		04284-86302	ROMs (Ver. 1.11) set
		►C	A7U7	04284-85403	ROM 20K BIT0
		►C	A7U20	04284-85404	ROM 20K BIT8

►: New Item C: Change D: Delete A: Add

Agilent 4284A PRECISION LCR Meter
(Including Option 001, 006, 201, 202, 301)

Service Manual

SERIAL NUMBERS

This manual applies directly to instruments whose serial number prefix is 2826J-, 2832J- or 2848J-, and whose ROM-based firmware version 01.10. For additional important information about serial numbers, read "SECTION 1, SERIAL NUMBER of this Service Manual."

Agilent Technologies

Agilent Part No. 04284-90100
Printed in JAPAN July 2000

Notice

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Component Test PGU-Kobe
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Hyogo, 651-2241 Japan

Manual Printing History

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates that are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

January 1989 .... First Edition (part number: 04284-90100)

July 2000 .... Second Edition (part number: 04284-90100)

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific *WARNINGS* elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.
The Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

Ground The Instrument

To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.

DO NOT Operate In An Explosive Atmosphere

Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT Service Or Adjust Alone

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT Substitute Parts Or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to a Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings

Warnings , such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

Warning **Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting this instrument.**

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institution's calibration facility, or to the calibration facilities of other International Standards Organization members.

Warranty

This Agilent Technologies instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment, except that in the case of certain components listed in *General Information* of this manual, the warranty shall be for the specified period. During the warranty period, Agilent Technologies will, at its option, either repair or replace products that prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent Technologies and Agilent Technologies shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent Technologies from another country.

Agilent Technologies warrants that its software and firmware designated by Agilent Technologies for use with an instrument will execute its programming instruction when property installed on that instrument. Agilent Technologies does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

Limitation Of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Agilent Technologies specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

Exclusive Remedies

The remedies provided herein are buyer's sole and exclusive remedies. Agilent Technologies shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For any assistance, contact your nearest Agilent Technologies Sales and Service Office. Addresses are provided at the back of this manual.

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TABLE OF CONTENTS

TABLE OF CONTENTS

A-2. MANUAL CHANGES

SECTION 1

GENERAL INFORMATION

1-1. INTRODUCTION

This manual contains technical information concerning the adjustment and servicing of the HP 4284A PRECISION LCR METER.

1-2. MANUAL ORGANIZATION

This manual contains four sections. A summary of each section follows.

SECTION 1. GENERAL INFORMATION

Section 1 describes this service manual and lists the recommended test equipment for performance testing, adjusting, and servicing the HP 4284A.

SECTION 2. ADJUSTMENTS

Section 2 provides the necessary adjustments required to ensure that the HP 4284A is within its published specifications after it has been repaired.

SECTION 3. ASSEMBLY SERVICE INFORMATIONS

Section 3 provides assembly service information (mechanical parts list, disassembly procedures, theory of operation, and faulty board isolation procedures). When repairing the HP 4284A: refer to this section first, isolate the faulty board, and then repair the HP 4284A at the component level using the faulty board's service sheet in SECTION 4.

SECTION 4. SERVICE SHEETS

Section 4 provides a service sheet for each board to use for component level repair of the faulty board. Each service sheet contains a circuit description, troubleshooting aids, replaceable parts list, component locations, and schematic diagram.

Some boards have been set up under the exchange assembly program. So, their service sheets only contain the exchange board's part number, and the test point information.

NOTE

The performance test procedure is given in Section 10 of the HP 4284A Operation Manual (P/N 04284-90000).

1-3. INSTRUMENTS COVERED BY THIS MANUAL

Hewlett-Packard uses a two-part, nine character serial number which is stamped on the serial number plate (see Figure 1-1) attached to the instrument's rear panel. The first four digits and the letter are the serial prefix and the last five digits are the suffix. The letter placed between the two sections identifies the country where the instrument was manufactured. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is unique to each instrument. The contents of this manual apply to instruments with the serial number prefixes listed under Serial Numbers on the title page.



Figure 1-1. Serial Number Plate

An instrument manufactured after the printing date of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates that the instrument is different from those described in this manual. The manual for a new instrument may be accompanied by a yellow Manual Changes supplement or have a different manual part number. The Manual Changes supplement contains "change information" that explains how to adapt the manual to newer instruments.

In addition to change information, the supplement may contain information for correcting errors (Errata) in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified by this manual's printing data and its part number, both of which appear on the manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard. If the serial prefix or number of an instrument is lower than that on the title page of this manual, see APPENDIX A, MANUAL CHANGES.

For information concerning serial number prefixes not listed on the title page or in the Manual Change supplement, contact the nearest Hewlett-Packard office.

1-4. RECOMMENDED TEST EQUIPMENT

Table 1-1 lists the equipment required for adjustment, performance testing, and troubleshooting the HP 4284A. Other equipment may be substituted if it meets or exceeds the critical specifications given in Table 1-1.

Table 1-1. Recommended Test Equipment (1 of 2)

Equipment	Requirements	Recommended Model	Use
Electronic Counter	Frequency: 20 Hz to 1 MHz Accuracy: <<0.01%	HP 5334B	**P**
RMS Voltmeter	Frequency: 20 Hz to 1 MHz Voltage range: 5 m to 20 Vrms Accuracy: <<3.0%	HP 3458A	**P,A,T**
DC Voltmeter	Voltage range: -40 V to 40 V Accuracy: <<0.1%	HP 3458A	**P,A,T**
Oscilloscope	Band Width: >10 MHz Range: 10 mV/div min.	HP 54111D	**A,T**
Oscilloscope Probe	Division Ratio: 10:1 Input Resistance: 1 MΩ	HP 10431A	**A,T**
Standard Capacitor	No substitute	HP 16380A HP 16380C	**P**
Standard Resistor	No substitute	HP 16074A	**P,A**
Resistor 100 ohm	No substitute	HP PN 04284-65004	**A**
Interface Box	No Substitute	HP PN 04284-65007	**P,A**
DC Power Source	+5 V, 0.1 A	HP 6214C	**P**
Adapter	BNC(f) to Dual Banana Tee, BNC(m)(f)(f)	HP PN 1251-2277 HP PN 1250-0781	**P,A** **T**
Cable	BNC(m)-to-BNC(m), 30 cm	HP PN 8120-1838	**P,A,T**
Test Leads	2 Alligator Clips-Dual Banana Plug 4 BNC(m), Cable Length 1 m 4 BNC(m), Cable Length 2 m 4 BNC(m), Cable Length 4 m	HP 11002A HP 16048A HP 16048D HP 16048E	**A,T** **P,A** **P,A** **P,A**
HP-IB Cable	HP-IB cable, 1 m	HP 10833A	**P,A,T**
Computer	HP Technical Computer With BASIC rev. 5.0 or above RAM's capacity: ≥1 M bytes	HP 9000 Series 200 Model 226	**P,A,T**
Memory Card	(furnished accessory)	HP PN 04278-89001	**P**

Table 1-1. Recommended Test Equipment (2 of 2)

Equipment	Requirements	Recommended Model	Use
Bias IF Simulator	No substitute	HP PN 42841-65001	**P,T**
Handler Simulator	No substitute	HP PN 04278-65001	**P,T**
Scanner Simulator	No substitute	HP PN 04278-65301	**P,T**
Simulator Cable	No substitute	HP PN 04278-61635	**P,T**
Bias IF Cable	No Substitute	HP PN 42841-61640	**P,T**
Extender Board	For Half Board	HP PN 04278-66596	**T**
	For Digital Board	HP PN 04278-66597	**T**
	For Analog Board	HP PN 04278-66598	**A,T**
Troubleshooting Cable	No substitute	HP PN 04284-61650	**T**

P: Performance Test
A: Adjustments
T: Troubleshooting

SECTION 2

ADJUSTMENTS

2-1. INTRODUCTION

This section describes the adjustments required to ensure that the HP 4284A Precision LCR Meter is within its published specifications after it has been repaired. These adjustments should be performed along with periodic maintenance to keep the HP 4284A in optimum operating condition. The recommended calibration cycle is six months. If proper performance cannot be achieved after calibration refer to the troubleshooting procedures in this service manual.

NOTE

To ensure proper results and correct instrument operation, Hewlett-Packard suggests a 30-minute warm-up and stabilization period before performing any of the following adjustments.

2-2. SAFETY CONSIDERATIONS

This manual contains **NOTE**s, **CAUTION**s, and **WARNING**s which must be followed to ensure the safety of the operator and to keep the instrument in a safe and serviceable condition. The adjustments covered in this section must be performed by qualified service personnel.

WARNING

ANY INTERRUPTION OF THE PROTECTIVE GROUND CONDUCTOR (INSIDE OR OUTSIDE THE INSTRUMENT) OR DISCONNECTION OF THE PROTECTIVE GROUND TERMINAL CAN MAKE THE INSTRUMENT DANGEROUS. INTENTIONAL INTERRUPTION OF THE PROTECTIVE GROUND SYSTEM FOR ANY REASON IS PROHIBITED.

The removal or opening of covers for adjustment, or removal of parts other than those which are accessible by hand will expose circuits containing dangerous voltage levels.

Remember that even though you have turned the HP 4284A off, and unplugged it, the capacitors in the HP 4284A can remained charged for several minutes.

WARNING

THE ADJUSTMENTS DESCRIBED IN THIS SECTION ARE PERFORMED WITH POWER APPLIED AND THE PROTECTIVE COVERS REMOVED. DANGEROUS VOLTAGE LEVELS EXIST AT MANY POINTS AND CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH IF YOU COME INTO CONTACT WITH THEM.

2-3. TEST EQUIPMENT

Table 1-1 lists the test equipment required to perform the adjustments described in this section. Use only calibrated test equipment when adjusting the HP 4284A. If the recommended test equipment is not available, equipment whose specifications are equal to, or surpass those of the recommended test equipment may be used.

2-4. ADJUSTABLE COMPONENTS

Table 2-1 lists the HP 4284A's adjustable components, the name of the adjustment related to each component, and gives a brief description of each adjustment.

Table 2-1. Adjustable Components

Adjustable Component	Adjustment Name	Description
A1R19	FREQ-ADJ	Power Supply Switching Frequency Adjustment
A1R52	V-ADJ	Power Supply Output Voltage Adjustment
A2R123	NULL AMP VOS ADJ	Null Amp. DC offset Adjustment
A2R224	0 DEG	Zero Offset Adjustment (0°)
A2R324	90 DEG	Zero Offset Adjustment (90°)
A3R353	SENSE AMP VOS ADJ	Sense Amp. DC Offset Adjustment
A5R11	OSC LVL	Signal Source Adjustment

2-5. ADJUSTMENT INTERACTION

Some of the HP 4284A adjustments are interactive. If you repair or replace an HP 4284A assembly, be sure to perform the related adjustment(s) in the sequence given. Table 2-2 lists the adjustments required for each assembly repaired or replaced. Ignoring or changing the adjustment sequence will make it impossible to obtain optimum performance.

Table 2-2. Required Adjustments

Assembly Replaced or Repaired		Adjustments Required (Paragraph Number)
A1	Power Supply	2-8
A2	Modulator	2-12
A3	Range Resistor	2-9, 2-11, 2-12
A3	Range Resistor (Opt. 001)	2-9, 2-10, 2-11, 2-12
A4	Hi-PW Amplifier (Opt. 001)	2-10, 2-11
A5	Signal Source	2-11
A6	Vector Ratio Detector	2-11, 2-12
A7	Digital Control	2-10*, 2-11, 2-12
A9	Keyboard	None
A11	Mother Board	None
A13	DC-AC Converter	None
A20	HP-IB Interface	None
A30	Handler Interface (Opt. 201)	None
A31	Handler Interface (Opt. 202)	None
A40	Scanner Interface (Opt. 301)	None
A51	Bias Current I/F (Opt. 002)	None
A90	Keyboard/Display Control	None
A91	LCD Module	None

*: Option 001 only

2-6. INITIAL OPERATING PROCEDURE

Before you start, perform the OPERATIONAL VERIFICATION and the DISASSEMBLY procedures given in the following paragraphs to prepare the HP 4284A for adjustment. The HP 4284A must be initialized (set to its initial control settings), before each adjustment. Exceptions to these settings will be noted as they occur. After you complete an adjustment reinitialize the HP 4284A.

NOTE

The HP 4284A is initialized in following three conditions.

1. HP 4284A is turned ON.
2. HP 4284A receives an HP-IB ***RST** command.
3. **SYSTEM RESET** is performed.

OPERATIONAL VERIFICATION

Check that the line voltage selector switch on the rear panel of the HP 4284A is properly set. Turn the HP 4284A ON and let it warm-up and stabilize for at least 30 minutes. After the warm-up period, initialize the instrument. If the HP 4284A fails its self test or if you can't initialize it, refer to the troubleshooting procedures in this service manual.

DISASSEMBLY, TOP COVER REMOVAL

To gain access to the adjustment points, perform the following procedure.

1. Remove the two plastic instrument-feet located at the upper corners of the rear panel.
2. Fully loosen the top cover retaining screw located at the back of the top cover.
3. Slide the top cover towards the rear and lift it off.
4. Loosen the five screws that secure the right hand side top shield plate. You don't have to completely remove the screws.

WARNING

DO NOT REMOVE THE LEFT HAND SIDE TOP SHIELD PLATE ON WHICH WARNING MESSAGE IS PRINTED EXCEPT FOR THE POWER SUPPLY ADJUSTMENT.

5. Slide the top shield plate towards the front and lift it off.

WARNING

TO PROTECT AGAINST POSSIBLE ELECTRICAL SHOCK, USE INSULATED TOOLS TO MAKE ALL ADJUSTMENTS.

2-7. ADJUSTMENT PROGRAM

The Adjustment Program is required when performing parts of the HP 4284A's adjustments. Table 2-2 shows which adjustments require the adjustment program.

Table 2-2. Adjustment Program Requirement

Adjustment Name	Paragraph	Adjustment Program
Power Supply Adjustment	2-8	Not Required
Sense Amp DC Offset Adjustment	2-9	Not Required
DC Bias Level Adjustment	2-10	Required
Test Signal Level/Monitor Adj.	2-11	Required
Impedance measurement Adjustment	2-12	Required

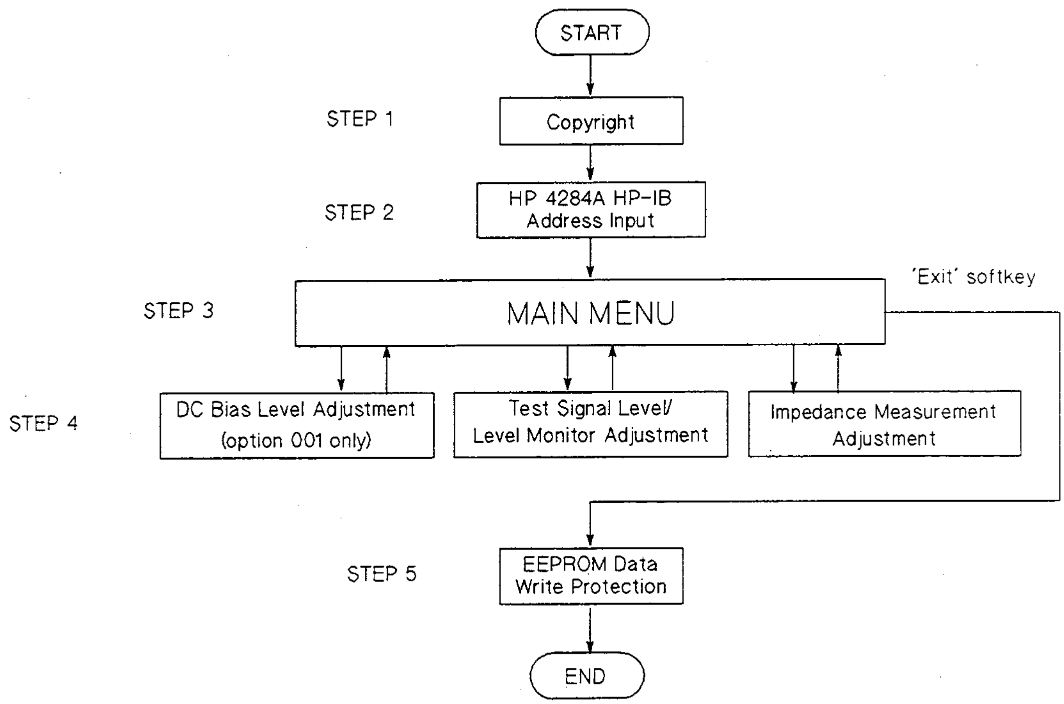
Paragraph 2-7-1 gives general information about the adjustment program. Paragraph 2-7-2 gives the initial operating procedure for the adjustment program. Paragraph 2-7-3 gives the adjustment program closing procedure.

2-7-1. GENERAL INFORMATION

Table 2-3 lists the adjustment program specifications. Figure 2-1 shows the adjustment program flow.

Table 2-3. Adjustment Program Specification

HP Part Number:	04284-65001 (5 inch floppy disk) 04284-65008 (3.5 inch floppy disk)
Language:	HP BASIC (rev. 5.0 and above)
Binary Requirement:	GRAPH, GRAPHX, HPIB, MAT, KBD, CLOCK, ERR, IO, CRTA, COMPLEX, CRTX (HP BASIC rev. 5.0)
Computer Requirement:	HP 9000 series 200 or series 300 computer with more than 1 M byte of RAM.
Write Protection:	Adjustment program is not write protected. Using a backup copy for adjustment program is recommended. Do not copy the program for purposes other than backup.
Adjustment for Options:	Adjustment program automatically identifies the HP 4284A's Option 001 and Option 006, and perform the adjustment according to the Options installed.



STEP1: Copyright and other information are displayed.

STEP2: The HP 4284A's HP-IB address must be registered to the adjustment program to control the HP 4284A by HP-IB.

STEP3: Adjustments can be selected using the softkeys. The program is finished by pressing the '**Exit**' softkey.

STEP4: Each adjustment is performed.

STEP5: EEPROM write protection is confirmed.

Figure 2-1. Adjustment Program Flow

2-7-2. INITIAL OPERATING PROCEDURE

This paragraph gives the procedure to perform before the Adjustments.

EQUIPMENT:

Adjustment Program Disc (5 inch)	PN 04284-65001
Computer	HP 9000 Series 200 Model 226
HP-IB Cable	HP 10833A

PROCEDURE:

1. Turn the HP 4284A OFF and remove the A7 board assembly.
2. Set the HP 4284A's EEPROM write protect jumper (A7W2) from the normal position (**N**) to the test position.
3. Install the A7 board assembly into the HP 4284A.
4. Connect the HP 4284A, HP 3458A and the Computer using the HP-IB Cables. The computer's interface select code must be set to 7. Figure 2-2 shows the setup.

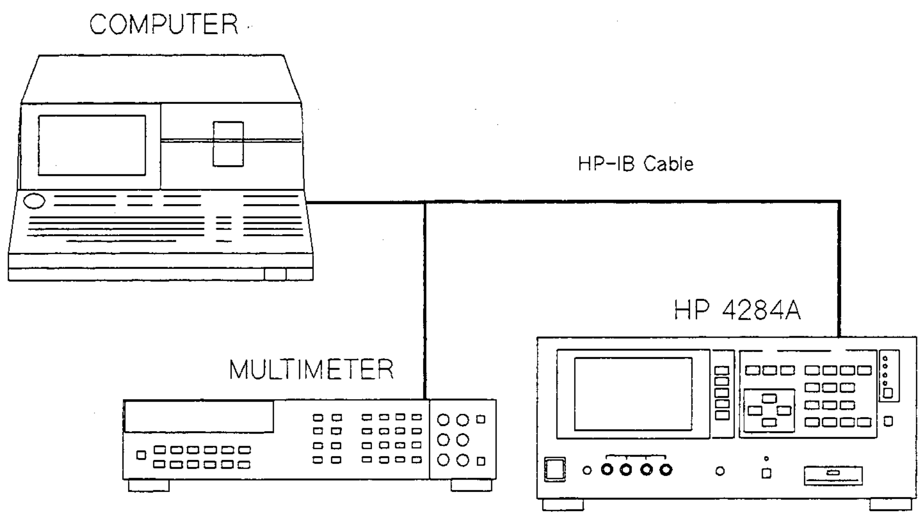


Figure 2-2. Adjustment Program Setup

5. Turn the HP 4284A, HP 3458A, and computer ON.
6. Change the HP 3458A's HP-IB address, if it is same as the HP 4284A's.
7. Boot up BASIC and load the necessary binary files in the computer. The necessary **BASIC BIN**aries for revision 5.0 are as follows.

   GRAPH, GRAPHX, IO, MAT, KBD, CLOCK,
   ERR, HPIB, CRTA, COMPLEX, CRTX

8. Load the calibration program in the computer, the file name is "**ADJ_4284A**".

NOTE

Do not remove the Adjustment Program Disk from the computer while the adjustment program is running.

9. Press the computer's **RUN** key, then copyright and other information are displayed. Press the '**Next Step**' softkey to continue the program.

NOTE

When the computer cannot access the HP 4284A, the HP-IB address registration display appears. Enter the HP 4284A's HP-IB address using the numeric keys and the '**Enter**' softkey.

10. After the copyright and other information are displayed, the Main Menu will be displayed. In the main menu, you can select the necessary adjustments using the softkeys.

NOTE

When you perform the adjustments, refer to paragraph 2-10 DC Bias Level Adjustment, 2-11 Test Signal Level/Level Monitor Adjustment and 2-12 Impedance Measurement Adjustment.

2-7-3. CLOSING PROCEDURE

This paragraph gives the procedure to finish the adjustment program. When the adjustment program is finished, HP 4284A's calibration data must be write protected.

1. The Main Menu is displayed on the controller's screen. Press the '**Exit**' softkey to finish the calibration program. Then the write protect display will appear.
2. Turn the HP 4284A OFF.
3. Replace the HP 4284A's EEPROM write protect jumper (A7W2) to its Normal position (**N**).
4. Replace the shield plate and the top cover.
5. Turn the HP 4284A ON.
6. Press the '**Ready**' softkey to examine the write protection and finish the adjustment program.

2-8. POWER SUPPLY ADJUSTMENTS

The following two part procedure adjusts the switching frequency and the output voltage of the switching power supply.

2-8-1. POWER SUPPLY SWITCHING FREQUENCY ADJUSTMENT

This adjustment sets the switching frequency of the power supply.

EQUIPMENT:

Oscilloscope	HP 54111D
10:1 Divider Oscilloscope Probe, 1 MΩ	HP 10431A

PROCEDURE:

1. Make sure the HP 4284A is turned OFF.
2. Loosen the two screws holding the left hand side top shield plate (the shield plate on which the **WARNING** message is printed), and remove it.

WARNING

DANGEROUS VOLTAGES ARE PRESENT ON THE BOARD UNDER THE SHIELD PLATE. DON'T TOUCH ANYPLACE EXCEPT WHERE INSTRUCTED TO.

3. Connect the 10:1 Probe to the Oscilloscope input.
4. Connect the probe's ground lead to A1TP12 (**GND**). Then connect the probe's tip to A1TP11. Figure 2-4 shows the location of TP11 and TP12.

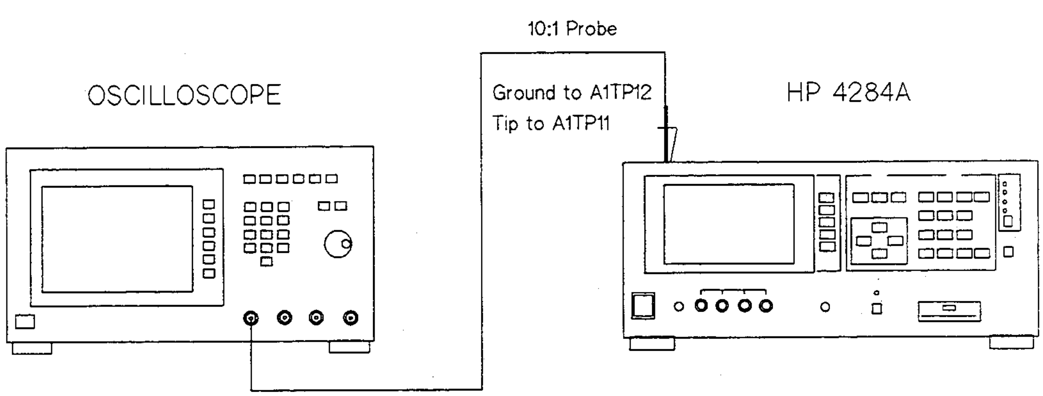


Figure 2-3. Power Supply Frequency Adjustment Setup

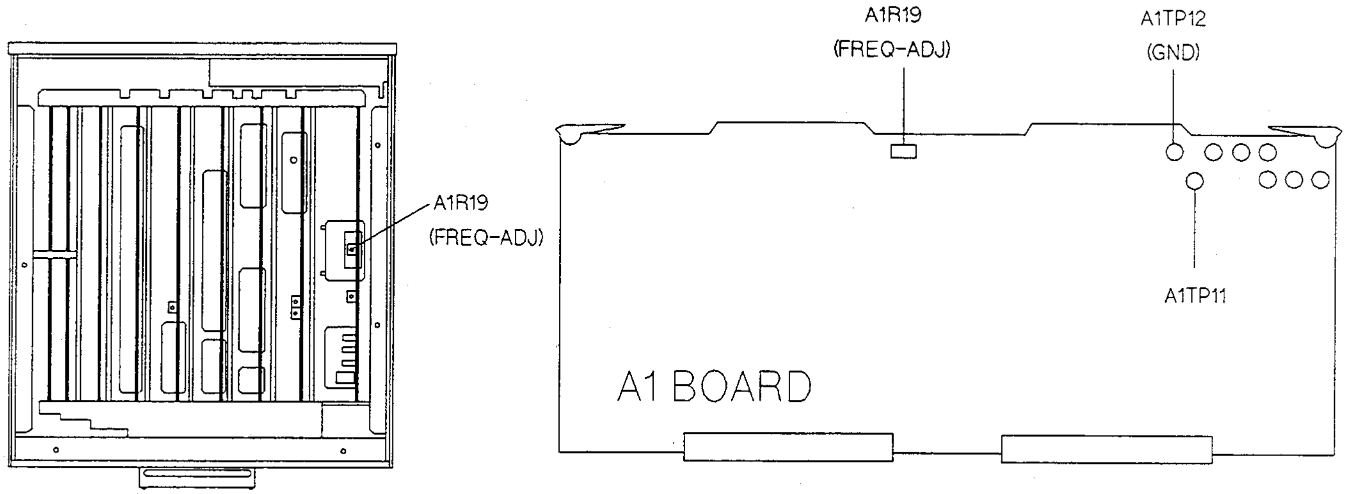


Figure 2-4. Power Supply Frequency Adjustment Location

5. Set the Oscilloscope controls as follows.

INPUT	Range:	40 V
	Offset:	10 V
	Coupling:	DC, 1 MΩ
TIMEBASE	Range:	50 µs

6. Turn the HP 4284A ON.

7. Adjust A1R19 (**FREQ-ADJ**) until the period (T), of the waveform, is 12.5 µs ± 0.5 µs, as shown in Figure 2-5. Figure 2-4 shows A1R19's location.

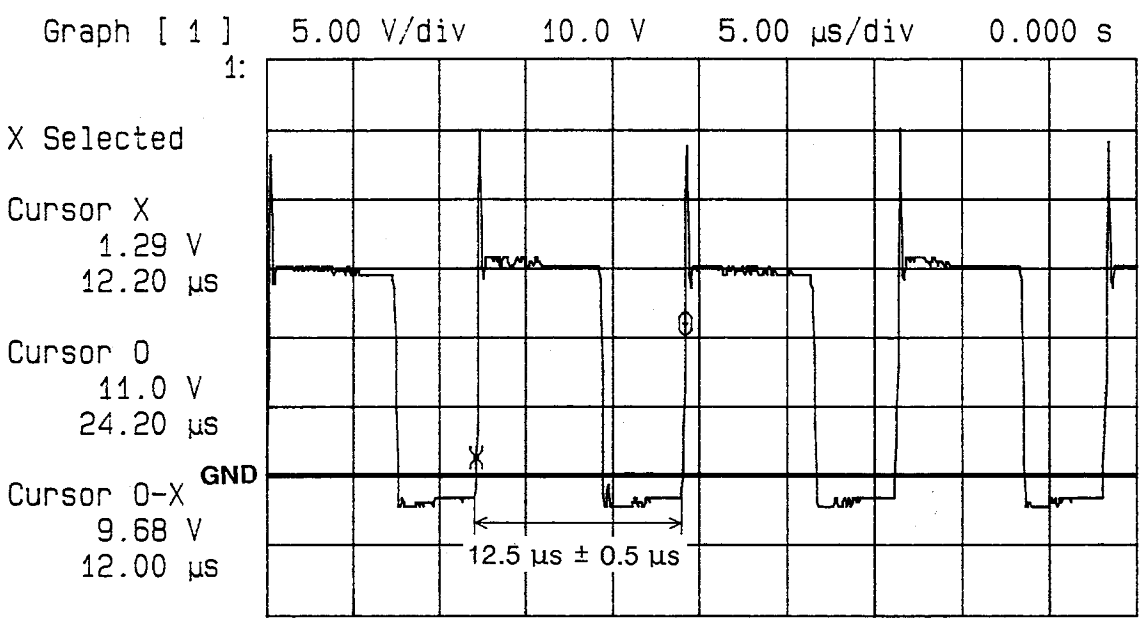


Figure 2-5. Switching Waveform

2-8-2. POWER SUPPLY OUTPUT VOLTAGE ADJUSTMENT

This procedure adjusts the output voltage of the power supply.

EQUIPMENT:

Multimeter	HP 3458A
2 Alligator Clips to 1 Dual Banana Plug Test Lead	HP 11002A

PROCEDURE:

1. Set the Multimeter to the DC voltage measurement function.
2. Connect the Test Leads to the multimeter.
3. Connect multimeter's Lo input to A7TP2 (**GND**), and connect the Hi input to A7TP1. Figure 2-7 shows the location of A7TP1 and A7TP2.

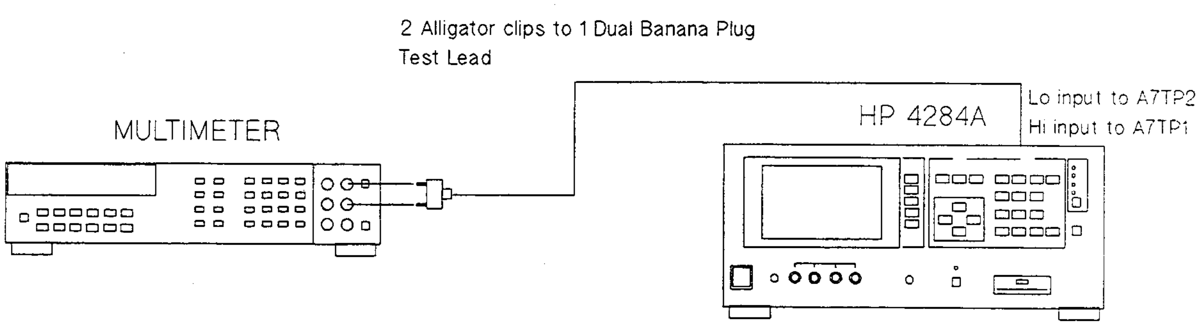


Figure 2-6. Power Supply Voltage Adjustment Setup

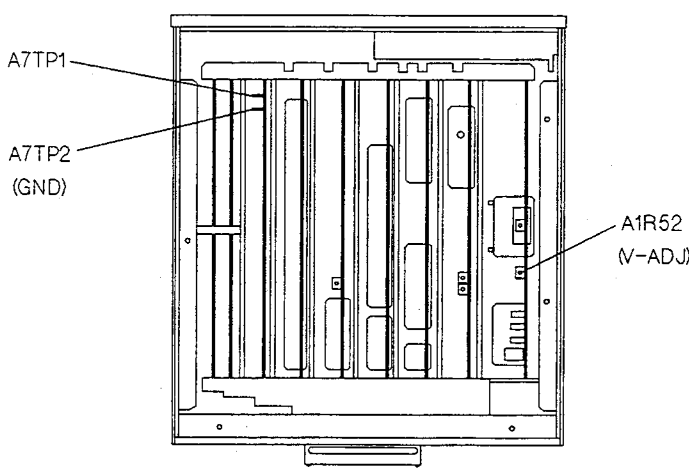


Figure 2-7. Power Supply Voltage Adjustment Location

4. Turn A1R52 (**V-ADJ**) fully **CCW** (Counter Clock-Wise). Figure 2-7 shows A1R52's location.

5. Adjust A1R52 until the multimeter reads 5 V ± 0.05 V.

2-9. SENSE AMPLIFIER DC OFFSET ADJUSTMENT

This adjustment minimize the DC offset voltage between the voltage channel sense amplifier and the current channel sense amplifier.

EQUIPMENT:

Multimeter	HP 3458A
Calibration R-L Standard	HP 16074A
Extender Board (For Analog Board)	HP PN 04278-66598
2 Alligator Clips to 1 Dual Banana Plug Test Lead	HP 11002A

PROCEDURE:

1. Connect OPEN to the **UNKNOWN** terminals.
2. Set the multimeter to DC voltage measurements function.
3. Connect the Test Lead to the multimeter input.
4. Hold up the A3 board using the extender board.
5. Connect the multimeter Lo input to A3TP4 (**ERR**). Then connect the multimeter Hi input to A3TP6 (**EDUT**). Figure 2-9 shows the location of TP4 and TP6.

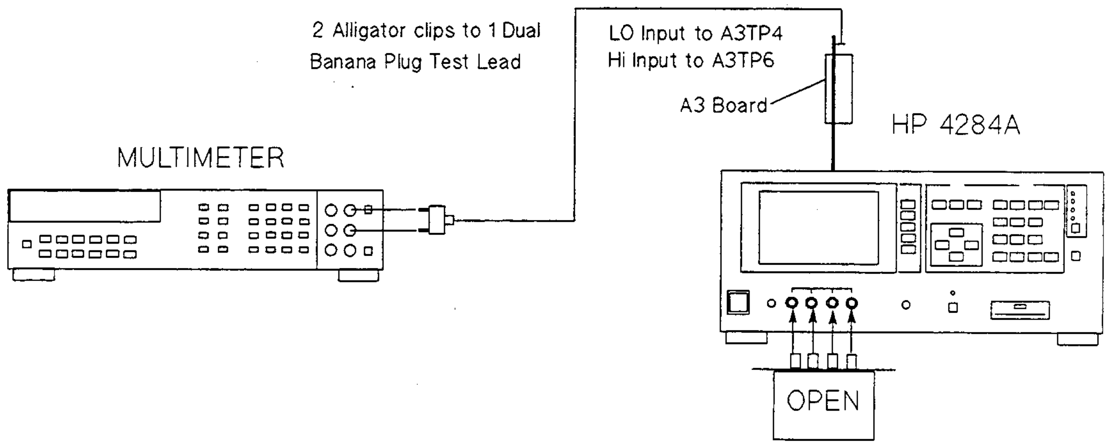


Figure 2-8. Sense Amplifier DC Offset Adjustment Setup

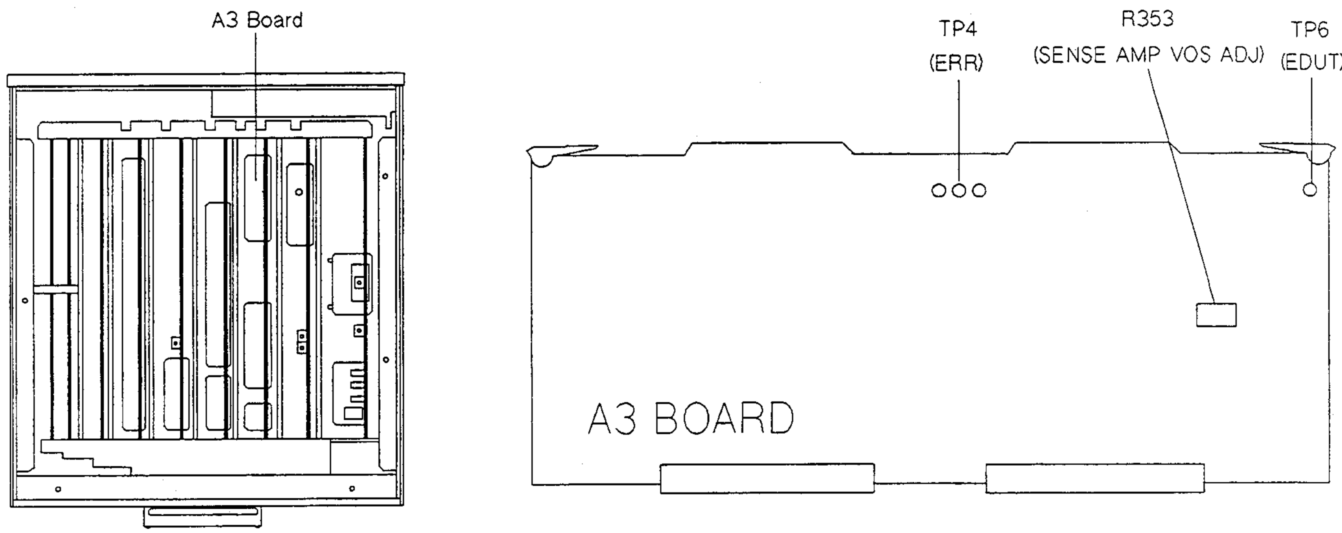


Figure 2-9. Sense Amplifier DC Offset Adjustment Location

6. Adjust A3R353 (**SENSE AMP VOS ADJ**), until the multimeter reads 0 ±10 mV. Figure 2-9 shows the location of A3R353.

2-10. DC BIAS LEVEL ADJUSTMENT (OPTION 001 ONLY)

This adjustment updates the EEPROM Calibration Data to set the DC bias voltage. The adjustment program is necessary to perform this adjustment.

EQUIPMENT:

Computer	HP 9826A
Multimeter	HP 3458A
HP-IB Cable	HP 10833A
Interface Box	HP PN 04284-65007
BNC(m) to BNC(m) Cable (30 cm)	HP PN 8120-1838
BNC(f) to Dual Banana Plug Adapter	HP PN 1251-2277

PROCEDURE:

1. Display the adjustment program's main menu, referring to paragraph 2-7-2. INITIAL OPERATING PROCEDURE.

2. Press the '**Adj.1**' softkey to select the DC Bias Level Adjustment.

NOTE

When the computer cannot access the HP 3458A, the HP-IB address registration display appears. Enter the HP 3458A's HP-IB address using the numeric keys and the '**Enter**' softkey.

3. Perform the adjustment according to the program's instruction. Figure 2-10 shows the adjustment setup.

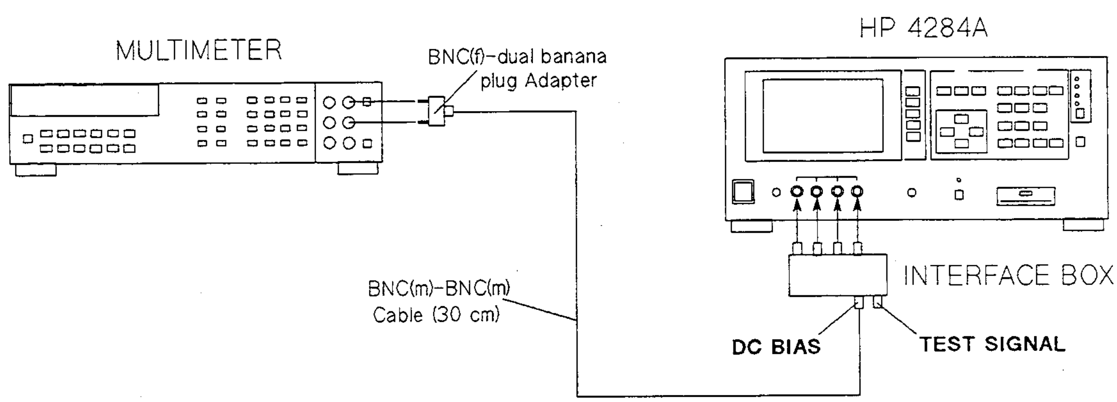


Figure 2-10. DC Bias Level Adjustment Setup

2-11. TEST SIGNAL LEVEL/LEVEL MONITOR ADJUSTMENT

This adjustment sets the signal source output voltage, then updates the EEPROM calibration data to set the test signal level and test signal level monitor reading.

EQUIPMENT:

Computer	HP 9826A
Multimeter	HP 3458A
HP-IB Cable	HP 10833A
Resistor 100 ohm	HP PN 04284-65004
Interface Box	HP PN 04284-65007
BNC(m) to BNC(m) Cable (30cm)	HP PN 8120-1838
BNC(f) to Dual Banana Plug Adapter	HP PN 1251-2277

2:Adjustments

PROCEDURE:

1. Display the adjustment program's main menu, referring to paragraph 2-7-2, INITIAL OPERATING PROCEDURE.

2. Press the '**Adj.2**' softkey to select the Test Signal Level/Level Monitor Adjustment.

NOTE

When the computer cannot access the HP 3458A, the HP-IB address registration display appears. Enter the HP 3458A's HP-IB address using the numeric keys and the '**Enter**' softkey.

3. Perform the signal source adjustment according to the program's instruction. Figure 2-11 shows the adjustment setup, Figure 2-12 shows the location of A5R11 (**OSC LVL**).

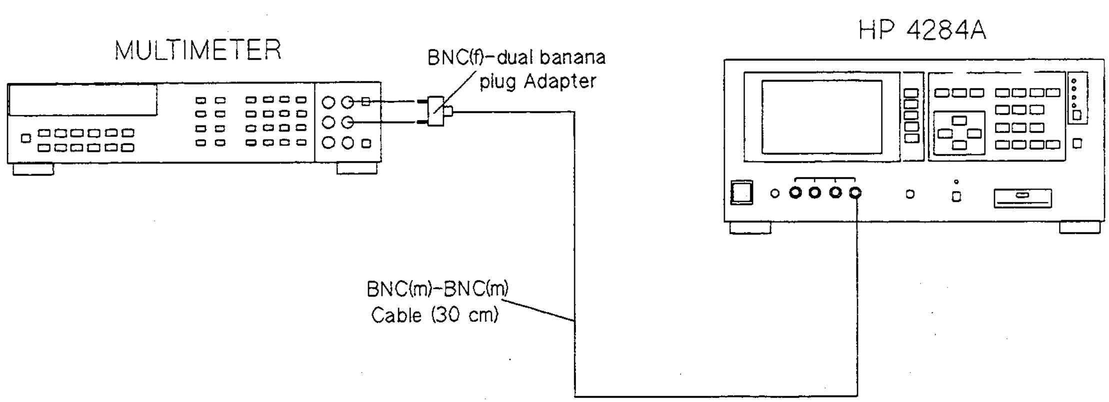


Figure 2-11. Signal Source Adjustment Setup

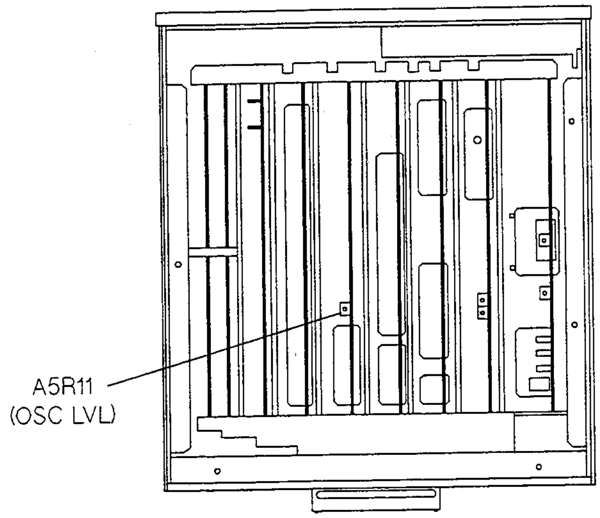
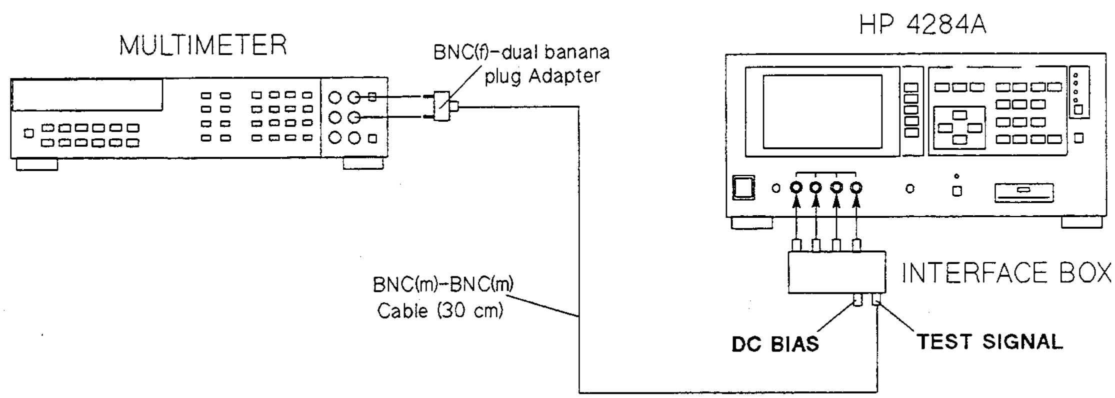


Figure 2-12. Signal Source Adjustment Location

4. Perform the test signal level/level monitor adjustment (EEPROM data updating) according to the program's instruction. Figure 2-13 shows the adjustment setup.

(1) Test Signal Level Adjustment Setup



(2) Test Signal Level Monitor Adjustment Setup

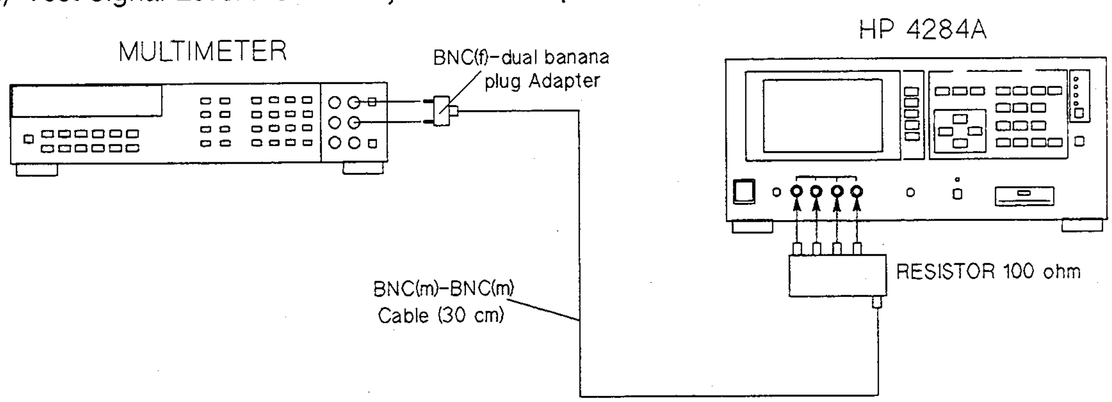


Figure 2-13. Test Signal Level/Level Monitor Adjustment Setup

2-12. IMPEDANCE MEASUREMENT ADJUSTMENT

This adjustment minimizes the null amplifier DC offset and the zero offset, and then updates the EEPROM calibration data to optimize the impedance measurement accuracy.

NOTE

All other adjustments must have been completed before performing this adjustment.

EQUIPMENT:

Computer	HP 9826A
Multimeter	HP 3458A
HP-IB Cable	HP 10833A
2 Alligator Clips to 1 Dual Banana Plug	
Test Lead	HP 11002A
Calibration R-L Standard	HP 16074A
Adapter BNC(f) to BNC(f)	HP PN 1250-0080 4 ea.
Test Leads (1 m)	HP 16048A
Test Leads (2 m)	HP 16048D (Option 006 only)
Test Leads (4 m)	HP 16048E (Option 006 only)

PROCEDURE:

1. Display the adjustment program's main menu, referring to paragraph 2-7-2, INITIAL OPERATING PROCEDURE.

2. Press the '**Adj.3**' softkey to select the Impedance Measurement Adjustment.

NOTE

When the computer cannot access the HP 3458A, the HP-IB address registration display appears. Enter the HP 3458A's HP-IB address using the numeric keys and the '**Enter**' softkey.

3. Perform the null amplifier DC offset adjustment according to the program's instruction. Figure 2-14 shows the adjustment setup, Figure 2-15 shows the A2TP3 (**X30**), A2TP4 (**GND**) and A2R123 (**NULL AMP VOS ADJ**) locations.

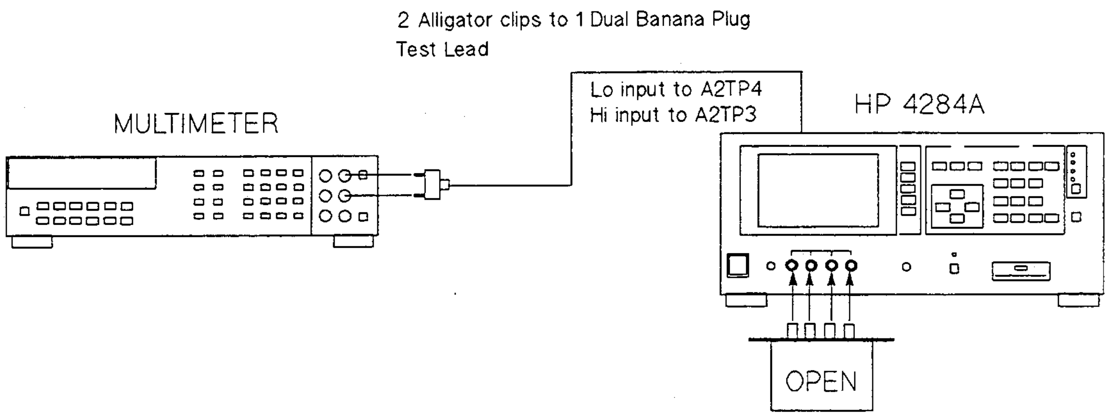


Figure 2-14. Null Amplifier DC Offset Adjustment Setup

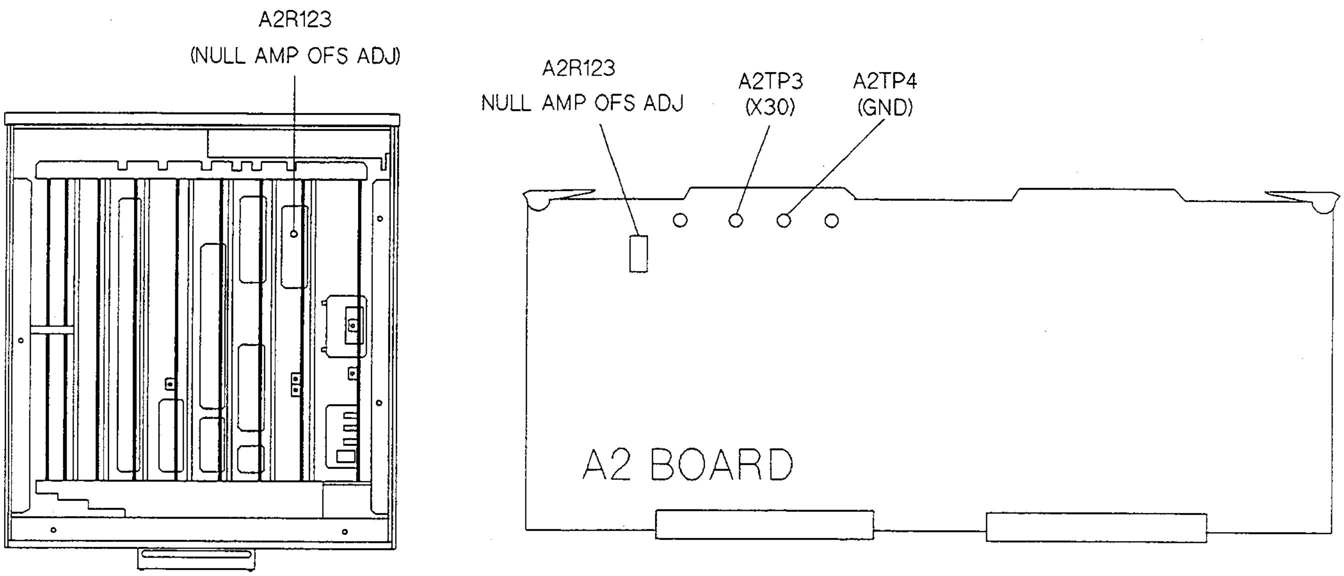


Figure 2-15. Null Amplifier DC Offset Adjustment Location

4. Perform the zero offset adjustment according to the program instruction. Figure 2-16 shows the A2R224 (**0 DEG**) and A2R324 (**90 DEG**) locations.

NOTE

The Top Shield Plate upon A2 through A7 board must be replaced when performing the zero offset adjustment.

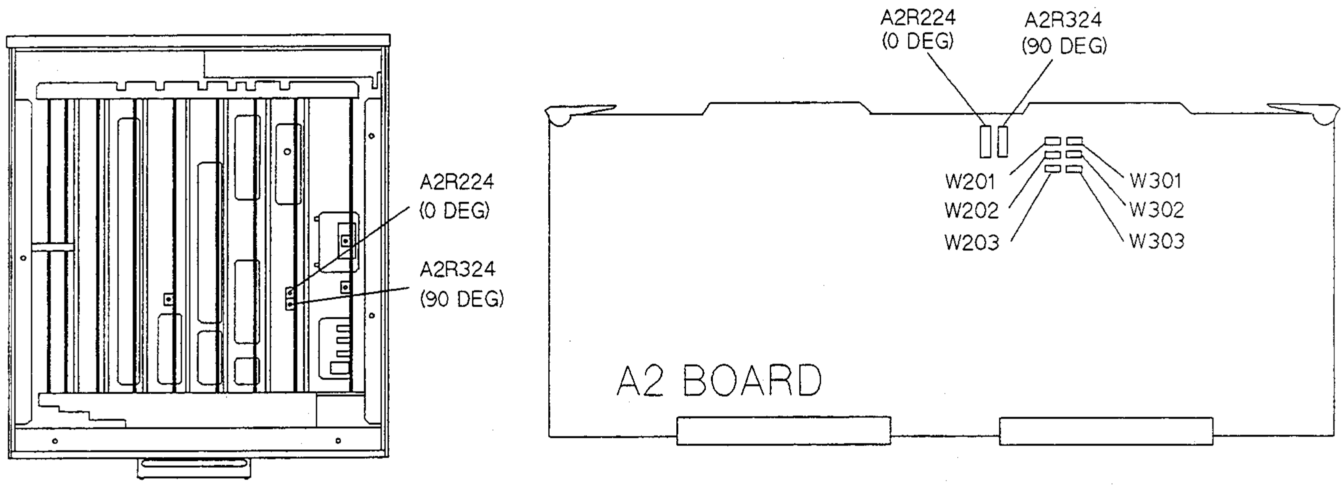


Figure 2-16. Zero Offset Adjustment Location

NOTE

If R224 and R324 cannot be adjusted, change W201, W202, W203, W301, W302, and W303 jumper settings and try again. W201, W202 and W203 are related to R224. W301, W302 and W303 are related to R324. Figure 2-17 shows the relation between the jumper settings and the adjustable range. After changing the jumper settings, press the '**Retry**' softkey to reset the HP 4284A's adjustment conditions.

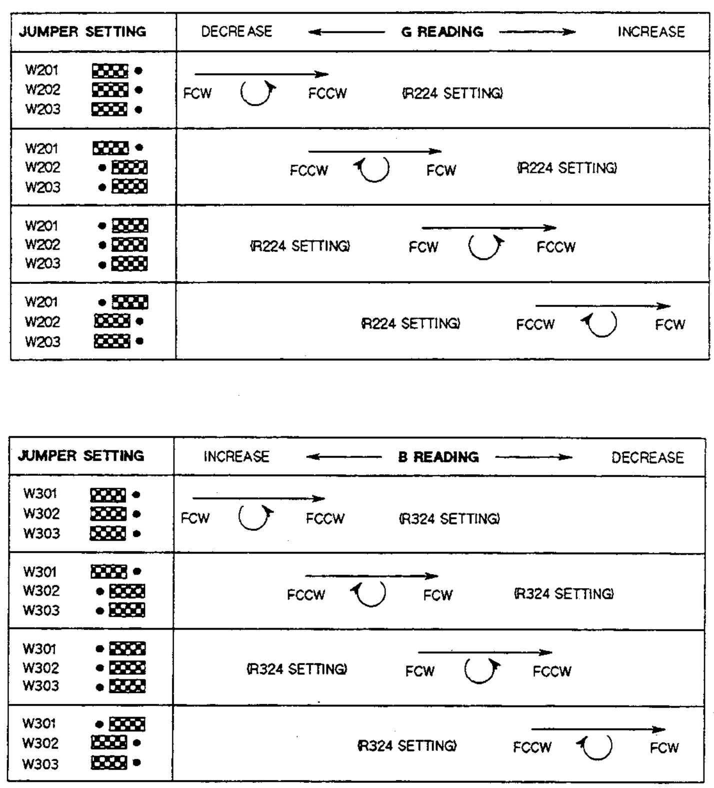


Figure 2-17. Jumper Settings VS. Adjustable Range

5. Perform the impedance measurement adjustment (EEPROM data updating) according to the program instruction. Figure 2-18 shows the adjustment setup.

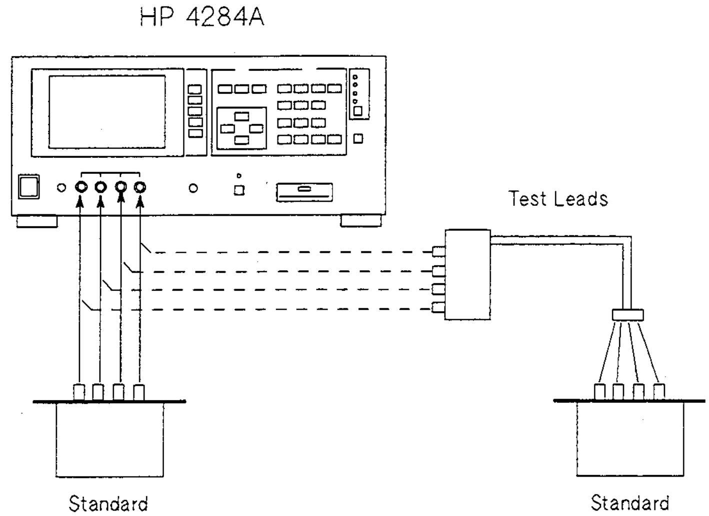


Figure 2-18. Impedance Measurement Adjustment Setup

SECTION 3

ASSEMBLY SERVICE INFORMATION

3-1. INTRODUCTION

This section provides assembly service information for the HP 4284A PRECISION LCR METER (20 Hz to 1 MHz) assemblies.

3-2. SAFETY CONSIDERATIONS

This section contains **WARNINGS** and **CAUTIONS** that must be followed for your protection and to avoid damaging the equipment.

WARNING

THE MAINTENANCE PROCEDURES DESCRIBED HEREIN ARE PERFORMED WHEN POWER IS SUPPLIED TO THE INSTRUMENT AND ITS PROTECTIVE COVERS ARE REMOVED. THIS TYPE OF MAINTENANCE MUST BE PERFORMED ONLY BY SERVICE-TRAINED PERSONNEL WHO ARE AWARE OF THE HAZARDS INVOLVED (FOR EXAMPLE, FIRE AND ELECTRICAL SHOCK). WHEN MAINTENANCE CAN BE PERFORMED WITHOUT POWER APPLIED TO THE INSTRUMENT, REMOVE POWER FROM THE INSTRUMENT. BEFORE ANY REPAIR IS COMPLETED, ENSURE THAT ALL SAFETY FEATURES ARE INTACT AND FUNCTIONING, AND THAT ALL NECESSARY PARTS ARE PROPERLY CONNECTED TO THE PROTECTIVE GROUNDING SYSTEM.

3-3. RECOMMENDED TEST EQUIPMENT

The required troubleshooting test equipment are listed in Table 1-1, Section 1. The table lists the type of instruments required, their critical specifications, and the model numbers of the equipment recommended. If the recommended models are not available, equipment which meets or exceeds all of the critical specifications may be substituted.

3-4. AFTER SERVICE PRODUCT SAFETY CHECKS

WARNING

WHENEVER IT APPEARS LIKELY THAT PROTECTIVE SAFETY PROVISIONS HAVE BEEN IMPAIRED, THE APPARATUS SHALL BE MARKED AS INOPERATIVE AND SHOULD BE SECURED AGAINST ANY UNINTENDED OPERATION. THE PROTECTION PROVISIONS WILL HAVE LIKELY BEEN COMPROMISED IF, FOR EXAMPLE:

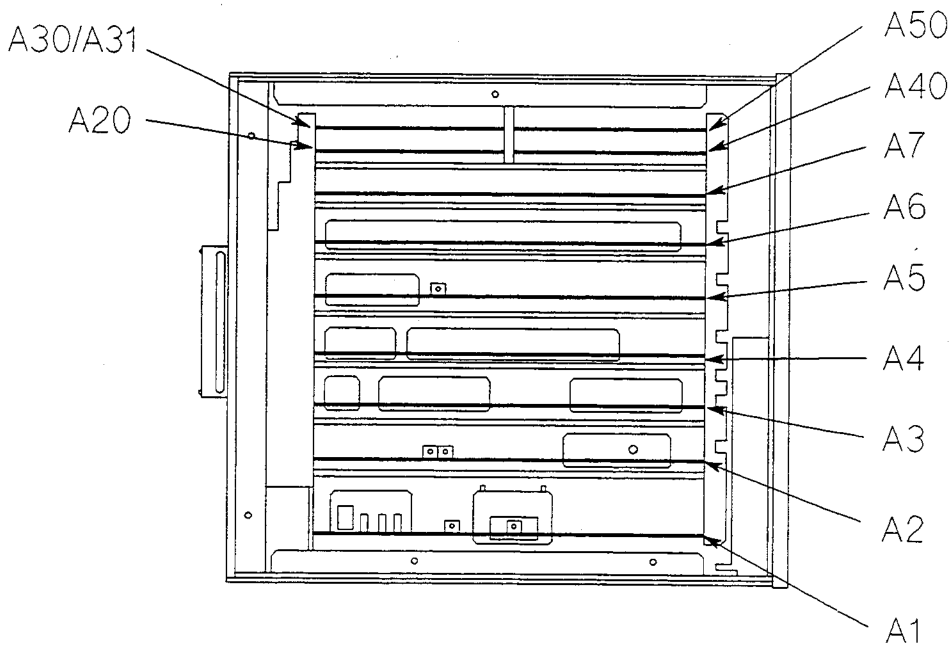
- **INSTRUMENT SHOWS VISIBLE DAMAGE.**
- **THE INSTRUMENT FAILS TO PERFORM THE INTENDED MEASUREMENT.**
- **THE UNIT HAS UNDERGONE PROLONGED STORAGE UNDER UNFAVORABLE CONDITIONS.**
- **THE INSTRUMENT WAS SEVERELY STRESSED IN TRANSPORT.**

Perform the following five checks to verify the 4284A's safety (these checks may also be used for safety checks after troubleshooting and repair).

1. Visually inspect the interior of the instrument for any signs of abnormal internally generated heat, such as discolored printed circuit boards and components, damaged insulation, or evidence of arcing. Determine the cause and repair.
2. Use an ohmmeter which can accurately measure 0.5 Ω to check the resistance from the instrument enclosure to the power cord's ground pin. The resistance must be less than 0.5 Ω. Flex the power cord while making this measurement to determine if any intermittent discontinuities exist.
3. Check the **GUARD** terminal on the front panel using the procedure outlined in step 2.
4. Unplug the 4284A's power plug from the power source. Set the power switch to **ON**. Tie the line and neutral pins of the power connector together and check the resistance between them and the instrument's enclosure. The minimum acceptable resistance is 2 MΩ. Find and replace any component which causes the instrument to fail this test.
5. Verify that the correct fuse is installed.

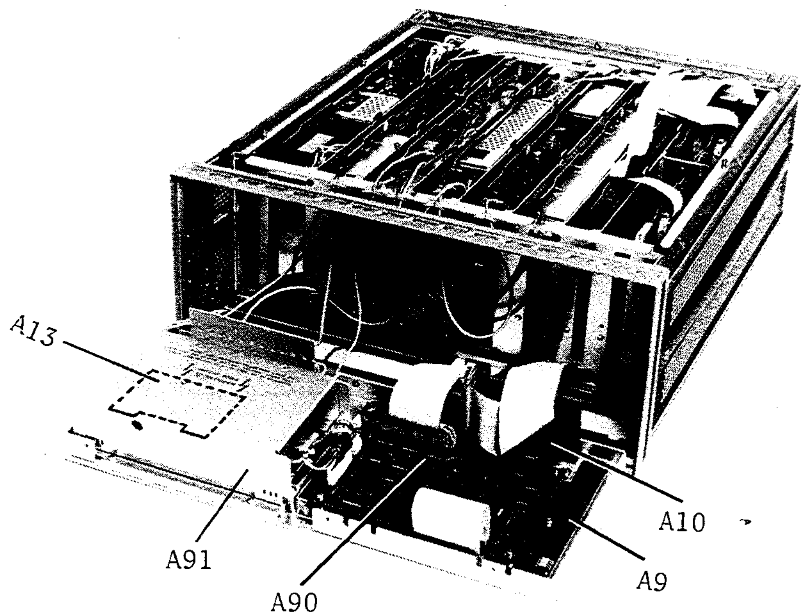
3-5. ASSEMBLY DESIGNATIONS AND LOCATIONS

Assemblies, such as printed circuit boards, are assigned sequential numbers, A1, A2 etc., as shown in Figure 3-1. Figure 3-1 also gives the location of the assemblies.



Assembly No.	Assembly Name
A1	Power Supply Board Assembly
A2	Modulator Board Assembly
A3	Range Resistor Board Assembly
A4	High Power Amplifier/DC Bias Board Assembly (Option 001)
A5	Signal Source Board Assembly
A6	Phase Detector/A-D Converter Board Assembly
A7	Digital Control Board Assembly
A11	Motherboard Assembly
A20	HP-IB Interface Board Assembly
A30/A31	Handler Interface Board Assembly (Option 201/202)
A40	Scanner Interface Board Assembly (Option 301)
A50	Bias Current Interface Board Assembly (Option 002)

Figure 3-1. Assembly Identification (1/2)



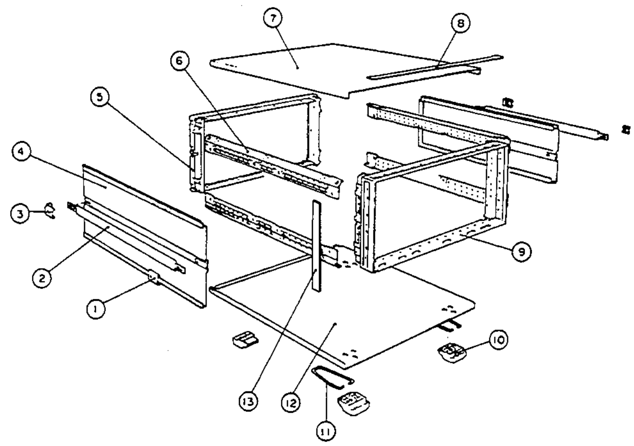
Assembly No.	Assembly Name
A9	Keyboard Assembly
A10	Memory Card Board Assembly
A13	DC-AC Converter Board Assembly
A90	Keyboard/Display Control Board Assembly
A91	LCD Module Assembly

Figure 3-1. Assembly Identification (2/2)

3-6. REPLACEABLE MECHANICAL PARTS LIST

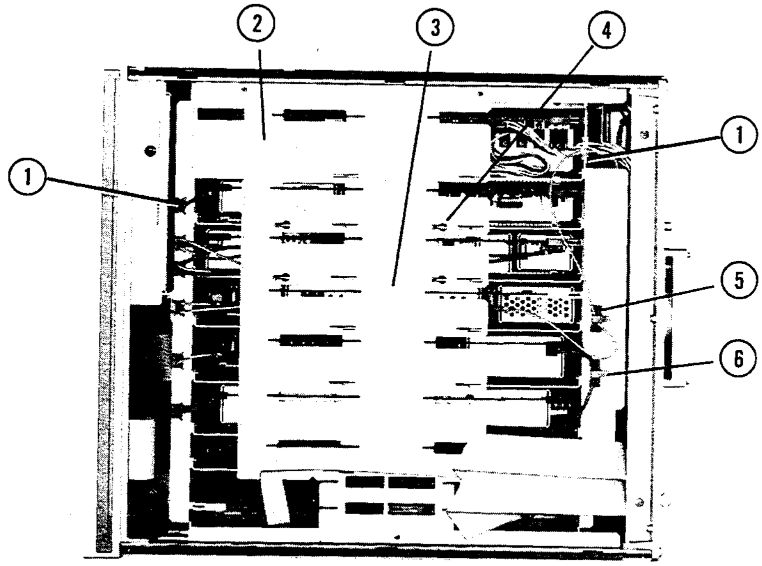
The replaceable mechanical parts are listed in Tables 3-1 to 3-9. The ordering information is given in SECTION 4.

Table 3-1. Major Mechanical Parts



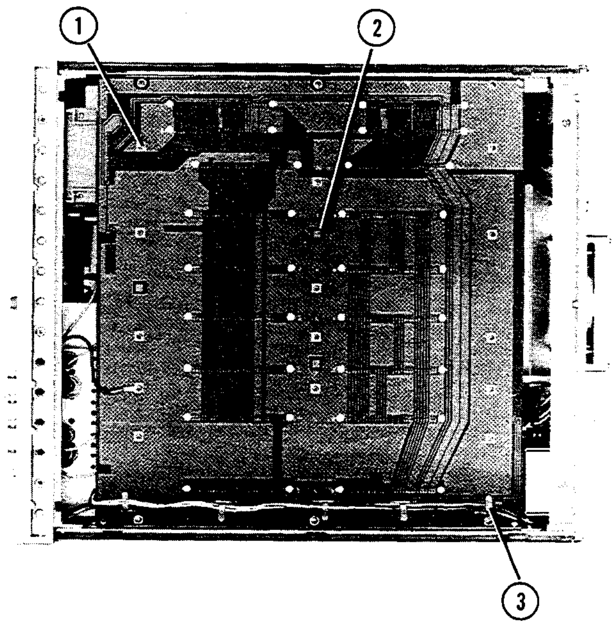
Reference Designator	Part Number	Qty	Description
1	5081-8819	2	Front Cap
2	5062-3704	2	Strap Handle
3	5041-8820	2	Rear Cap
4	5062-3842	2	Side Cover
	8160-0461		Gasket
5	5021-5806	1	Rear Frame
6	5021-5837	4	Corner Strut
7	5062-3735	1	Top Cover
8	5041-8802	1	Top Trim
9	5021-8405	1	Front Frame
10	5041-8801	4	Foot
11	1460-1345	2	Tilt Stand
12	5062-3747	1	Bottom Cover
13	5001-0540	2	Side Trim

Table 3-2. Top View (Top cover removed)



Reference Designator	Part Number	Qty	Description
1	1400-1048	7	Edge Saddle
2	04278-00633	1	Top Plate over A1 board
3	04284-00625	1	Top Plate over A2 thru A7
4	0515-1550	7	Screw
5	1400-1334	1	Cable Clamp
6 (Opt001)	1400-1334	1	Cable Clamp

Table 3-3. Bottom View (Bottom cover removed)



Reference Designator	Part Number	Qty	Description
1	0515-1550	20	Screw Pan-Head
2	0403-0285	3	Rubber Foot
3	1400-1334	5	Cable Clamp

3:Assembly Service Informations

Table 3-4. Front Panel Assembly Components (1/2)

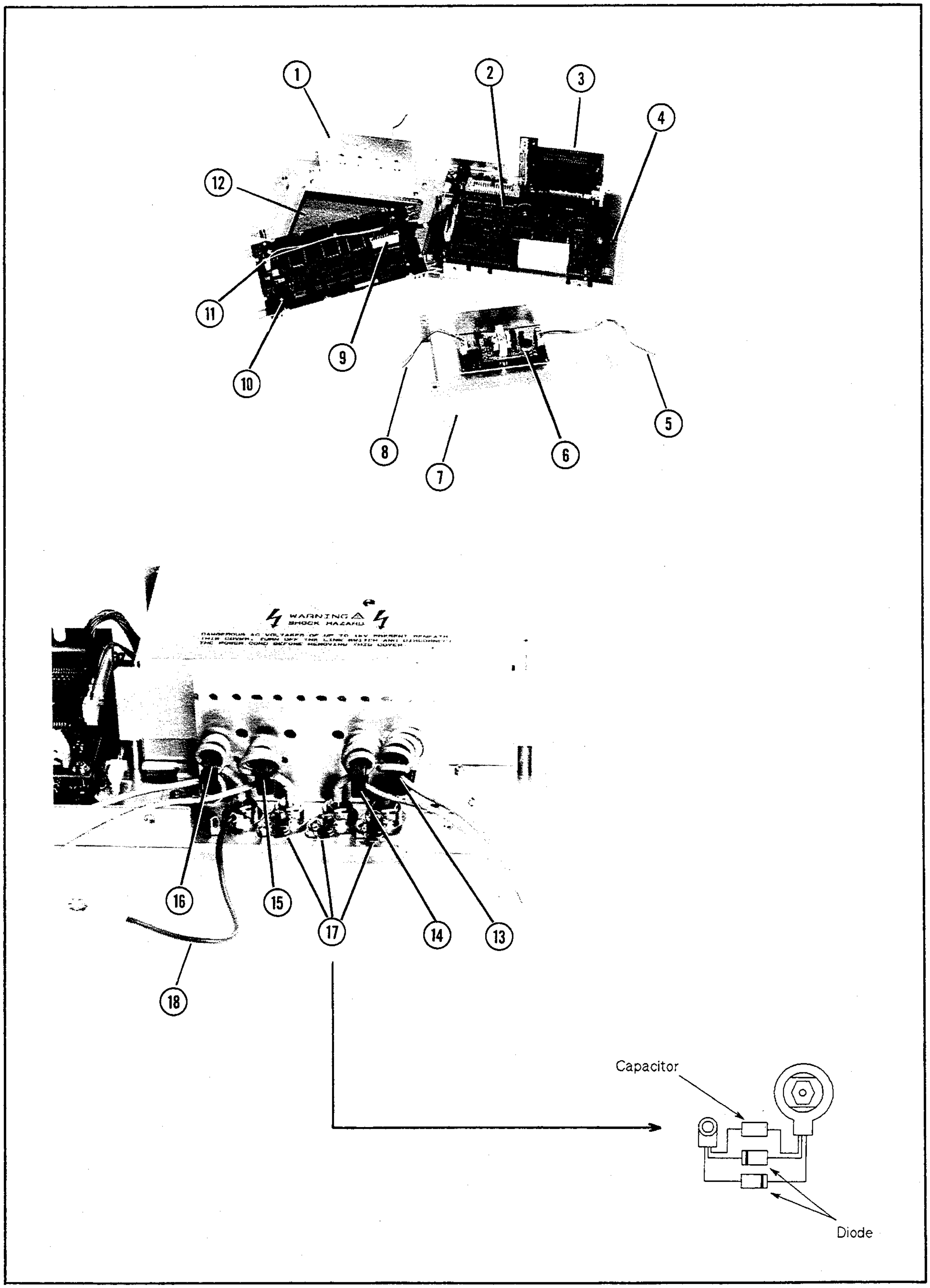
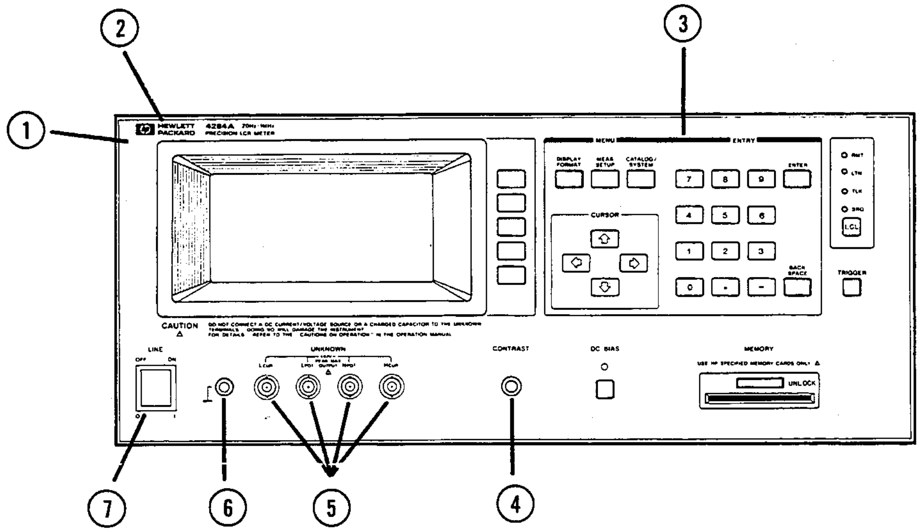


Table 3-4. Front Panel Assembly Components (2/2)

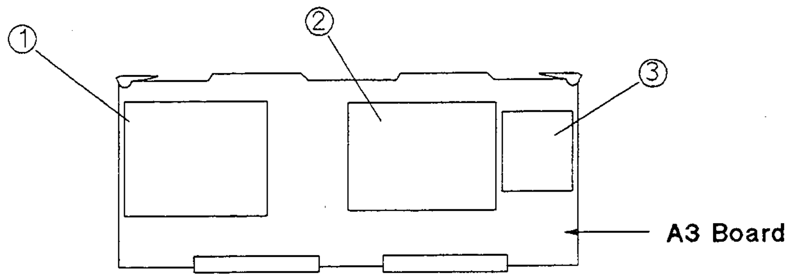
Reference Designator	Part Number	Qty	Description
1	04279-01201	1	Holder
	0535-0031	2	Nut
	1400-0249	4	Cable Tie
2	04278-66590	1	KEY&DISP Control Unit
	0515-1550	4	Screw
3	04278-66510	1	Memory Card Board
	04278-40002	1	Bezel
	04278-40003	1	Knob
	04278-08001	1	Spring
	3050-0891	4	Waher (F)
	0535-0031	2	Nut
	0515-0920	2	Screw (M3)
	2190-0584	2	Washer -LK HLCL
	0535-0004	2	Nut (M3)
4	04279-66559	1	Keyboard Unit
	04278-40005	1	Bezel
	04278-25001	1	Rubber Key
	0535-0031	7	Nut
5	04278-61615	1	Cable Assembly
6	04278-66513	1	DC-AC Converter Board
	0515-1550	1	Screw
7	04278-00624	1	Shield Case
	1400-1048	1	Edge Saddle
	0515-0910	4	Screw
	2190-0586	4	Washer
8	04278-61630	1	Cable Assembly (3-pin)
9	04278-61616	1	Cable Assembly (12-pin)
10	04278-61102	1	LCD Unit (A91)
11	04278-61631	1	Cable Assembly (2-pin)
12	04278-00205	1	Plate
	3150-0541	1	Filter
	04278-40001	1	Bezel
13	04284-61605	1	Magnet Coil Assembly "D" (Lcur)
14	04284-61604	1	Magnet Coil Assembly "C" (Lpot)
15	04284-61603	1	Magnet Coil Assembly "B" (Hpot)
16	04284-61602	1	Magnet Coil Assembly "A" (Hcur)
17	0160-4808	3	Capacitor 470 pF
	1901-1250	6	Diode
18	04284-61613	1	Cable Assembly

Table 3-5. Front Panel Components



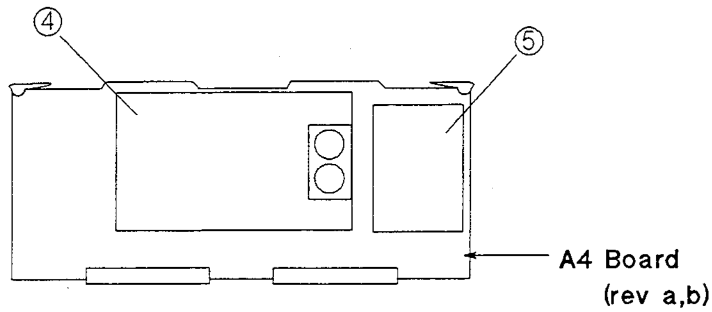
Reference Designator	Part Number	Qty	Description
1	04284-00201	1	Panel,Front
	04284-00202	1	Sub Panel
2	04278-40001	1	Bezel (Display)
	3150-0541	1	Filter
	04278-00205	1	Plate
	0515-1550	4	Screw
3	04278-25001	1	Rubber Key
	04278-40005	1	Bezel (Key)
4	0370-2446	1	Knob
5	1250-0252	4	BNC Connector
	5040-3324	4	Insulator (outside)
	5040-3325	4	Insulator (inside)
	2950-0035	4	Nut
	0360-1158	4	Lug
6	1510-0130	1	Binding Post
	2190-0084	1	Washer
	2950-0006	1	Nut
7	3101-2862	1	Power Switch (included in PN 04284-61611 (Power Switch Cable Assembly))

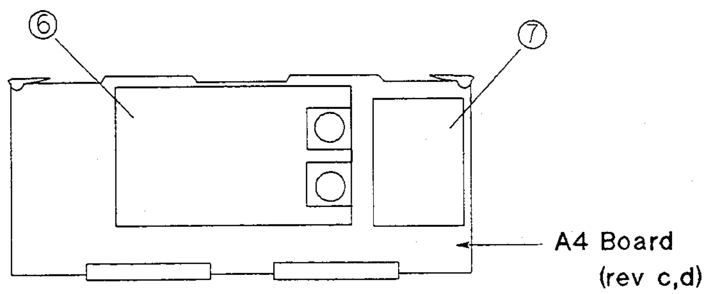
Table 3-6. Shield Case And Heat Sink (1 of 3)



Board No.	Reference Designator	Part Number	Qty	Description
A1		04278-00601	1	Shield on component side
		0515-1550	4	Screw Pan-Head
		04278-00602	1	Shield on circuit side
		0515-1007	4	Screw Flat-Head
		04278-01204	1	Heat Sink for CR28,CR29, CR30,and CR39
		0515-1550	3	Screw Pan-Head
		0515-1551	4	Screw Pan-Head (for CRs)
A2		04284-00604	1	Shield (Plate)
		04284-00602	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04284-00603	1	Shield on circuit side
		0515-1005	2	Screw Flat-Head
A3	1	04284-00635	1	Shield on component side
		0515-0914	2	Screw Pan-Head
		04284-00636	1	Shield on circuit side
		0515-1005	2	Screw Flat-Head
	2	04284-00638	1	Shield on component side
		0515-0914	2	Screw Pan-Head
		04284-00639	1	Shield on circuit side
		0515-1005	2	Screw Flat-Head
	3	04284-00640	1	Shield on component side
		0515-0914	2	Screw Pan-Head
		04284-00641	1	Shield on circuit side
		0515-1005	2	Screw Flat-Head

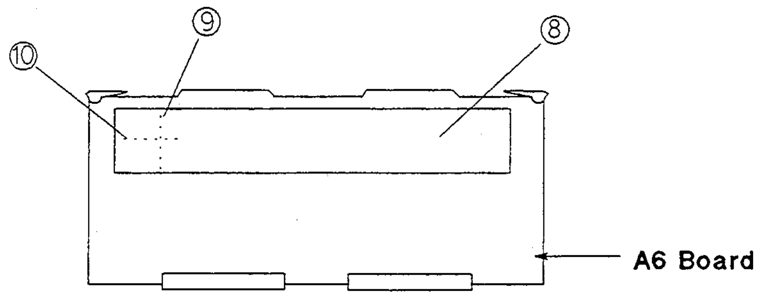
Table 3-6. Shield Case And Heat Sink (2 of 3)





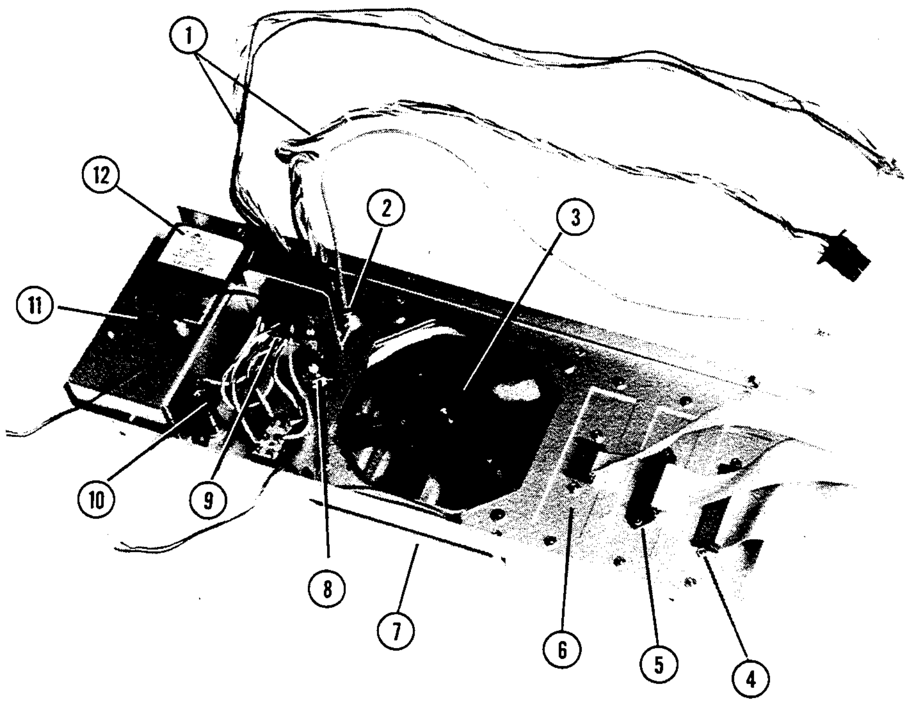
Board NO.	Reference Designator	Part Number	Qty	Description
A4 (rev a,b)	4	04284-00660	1	Shield on component side
		0515-0914	8	Screw Pan-Head
		04284-00632	1	Shield on circuit side (Large)
		0515-1005	4	Screw Flat-Head
		04284-01202	2	Heat Sink in 04284-00660
		0340-1006	6	Insulator for 04284-01202
		0515-1550	5	Screw for 04284-01202
		4040-1907	2	Heat Sink Rubber on circuit side
	5	04284-00633	1	Shield on component side (small)
		0515-0914	2	Screw Pan-Head
		04284-00634	1	Shield on circuit side (small)
		0515-1005	2	Screw Flat-Head
A4 (rev c,d)	6	04284-00631	1	Shield on component side
		0515-0914	8	Screw Pan-Head
		04284-00632	1	Shield on circuit side (Large)
		0515-1005	4	Screw Flat-Head
		04284-01202	2	Heat Sink in 04284-00631
		0340-1006	6	Insulator for 04284-01202
		0515-1550	5	Screw for 04284-01202
		4040-1907	3	Heat Sink Rubber on circuit side
	7	04284-00633	1	Shield on component side (small)
		0515-0914	2	Screw Pan-Head
		04284-00634	1	Shield on circuit side (small)
		0515-1005	2	Screw Flat-Head

Table 3-6. Shield Case And Heat Sink (3 of 3)



Board NO.	Reference Designator	Part Number	Qty	Description
A5		04284-00610	1	Shield on component side
		0515-1550	2	Screw Pan-Head
		04284-00611	1	Shield on circuit side
		0515-1005	2	Screw Flat-Head
		1205-0696	1	Heat Sink for U18
		1205-0318	1	Heat Sink for U210
A6	8	04284-00607	1	Shield on component side
		0515-01550	4	Screw Pan-Head
		04284-00608	1	Shield on circuit side
		0515-1006	4	Screw Flat-Head
	9	04284-00601	1	Shield (Punched Plate)
	10	04284-00606	1	Shield (Plain Plate)
		1205-0691	2	Heat sink for U8, U9

Table 3-7. Rear Panel Components



Reference Designator	Part Number	Qty	Description
1	04284-61611	1	Cable Assembly
	3101-2862	1	Power Switch (included in PN 04284-61611)
2			
(std)	6960-0041	1	Plug Hole
(opt001)	1250-0252	1	Connector BNC
	2190-0102	1	Washer
	2950-0035	1	Nut
	04284-61609	1	Cable Assembly
3	04279-61001	1	Fan Assembly
	0515-1598	4	Screw
	2190-0586	4	Washer
	1400-1334	1	Cable Clamp
4			
(std)	04278-00212	1	Blank Plate
	0515-1550	2	Screw
(opt201)	04278-00211	1	I/F Plate
	04278-61622	1	Flat Cable Assembly
	0515-1551	2	Screw for Connector
	0535-0031	2	Nut
	0515-1550	2	Screw for Plate
(opt202)	04278-00213	1	I/F plate
	04278-61622	1	Flat Cable Assembly
	0515-1551	2	Screw for Connector
	0535-0031	2	Nut
	0515-1550	2	Screw for Plate
5			
(std)	04284-00211	1	HP-IB Plate
	04278-61621	1	Flat Cable Assembly
	2190-0577	2	Washer
	0515-1550	2	Screw
(opt109)	04278-00212	1	Blank Plate
	0515-1550	2	Screw

Reference Designator	Part Number	Qty	Description
6			
(std)	04278-00212	1	Blank Panel
	0515-1550	2	Screw
(opt301)	04278-00216	1	I/F Plate
	04278-61632	1	Flat Cable Assembly
	0515-1551	2	Screw for Connector
	0535-0031	2	Nut
	0515-1550	2	Screw for Plate
(opt002)	04284-00210	1	I/F Plate
	04284-61610	1	Falt Cable Assembly
	0515-1551	2	Screw for Connector
	0535-0031	2	Nut
	0515-1550	2	Screw for Plate
	7120-0382	1	Label
7	04279-04001	1	Fan Cover
	0515-1550	4	Screw
8	1250-0083	1	Connector BNC
	0360-1190	1	Lug
	2190-0016	1	Washer
	2950-0001	1	Nut
	04278-61617	1	Cable Assembly
9	04278-61619	1	Cable Assembly
10	2110-0565	1	Cap
	2110-0303	1	Fuse (for 220/240V)
	2110-0381	1	Fuse (for 100/120V)
	2110-0566	1	Fuse Holder
	2110-0569	1	Nut
11	04278-00634	1	Shield
	1400-1334	1	Cable Clamp
	0515-1550	3	Screw
12	04278-61002	1	Filter Assembly
	0515-0910	2	Screw
	2190-0586	2	Washer
	04284-68001	1	Wire Assembly

Table 3-8. Coaxial Cable Assembly

Marker	Part Number	Qty	Description
"A" "H"	04284-61608	1	A5J200 to A64J1 (Opt 001)
"A"	04284-61602	1	A4J2 to Hcur (Magnet Coil Assembly)
"B"	04284-61603	1	A3J7 to Hpot (Magnet Coil Assembly)
"C"	04284-61604	1	A3J4 to Lpot (Magnet Coil Assembly)
"D"	04284-61605	1	A3J5 to Lcur (Magnet Coil Assembly)
"E" "E"	04284-61601	1	A3J6 to A6J1
"F" "F"	04284-61614	1	A3J8 to A6J2
"G" "G"	04284-61606	1	A3J3 to A2J3
"I"	04284-61609	1	A3J3 to Rear Panel (INT DC BIAS MONITOR)
"J" "J"	04284-61612	1	A5J201 to A6J7

Table 3-9. Label On Rear Panel

Part Number	Qty	Description
5080-3196	1	"OPTION #W30"
7120-0381	1	"OPT #001"
7120-0386	1	"OPT #006"

3-7. TOOLS AND FASTENERS

The 4284A's mechanical components are secured using metric threaded faseners. Many faseners in the 4284A may appear to be Phillips type, but they are in fact, Pozidrive type. To avoid damaging them, use only Pozidrive screwdrivers to remove or tighten Pozidrive type faseners.

3-8. DISASSEMBLY

Disassembly procedures are given in the following paragraphs. The top cover removal procedure is given first, and then the following paragraphs tell you how to remove each assembly from the instrument.

3-8-1. TOP COVER REMOVAL

The following procedures are common for gaining access to any of the assemblies.

1. Remove the two plastic instrument-feet located in the upper corners of the rear panel.
2. Fully loosen the top cover retaining screw located at the rear of the top cover.
3. Slide the top cover towards the rear and lift it off.

3-8-2. A1 ASSEMBLY REMOVAL

1. Loosen the two screws which secure the left hand side top shield plate. Don't completely remove them.

NOTE

There are two top shield plates. To gain access to the A1 assembly, remove the top shield plate which has the **WARNING** message printed on it.

WARNING

CAPACITORS ON THE A1 BOARD REMAIN CHARGED WITH HAZARDOUS VOLTAGES FOR A PERIOD OF TIME AFTER THE INSTRUMENT IS TURNED OFF, OR AFTER THE POWER CABLE IS DISCONNECTED. ALLOW AT LEAST ONE MINUTE FOR THE CAPACITORS TO DISCHARGE AFTER THE INSTRUMENT IS TURNED OFF OR THE POWER CABLE IS DISCONNECTED.

2. Slide the top shield plate towards the front and lift it off.
3. Lift the black and the brown board extractors at the top corners of the A1 assembly.
4. Disconnect the cable that connects between the A1 board assembly and the rear panel.

3-8-3. REMOVING THE A2, A3, A4, A5, A6, A7, A20, A30, A31, A40, OR A50 ASSEMBLIES

1. Loosen the five screws that secure the right hand side plate. Don't remove the screws completely.

NOTE

There are two top shield plates. In order to access the A2, A3, A4, A5, A6, A7, A20, A30, A31, A40, or A50 assemblies, remove the top shield plate on which the **WARNING** message label is **NOT** printed.

2. Slide the top shield plate towards the front and lift it off.
3. Lift the extractors at top corners of the board assembly that you want to remove.

3-8-4. FRONT PANEL DISASSEMBLY

This paragraph describes how to remove the front panel assembly from the 4284A. In order to remove the A9, A10, A13, A90, or A91 assembly which are shown in Figure 3-2, first disassemble the front panel assembly.

1. Remove the top trim from the front frame.
2. Remove the two front feet from the bottom cover.
3. Remove the three screws from the bottom of the front frame.
4. Remove the three screws from the top of the front frame.
5. Carefully remove the 4284A's front panel assembly.

3-8-5. A9 OR A90 ASSEMBLY REMOVAL

First remove the front panel assembly from the 4284A as described in paragraph 3-8-4.

1. Loosen the two hex set screws on the **CONTRAST** knob and remove it.
2. Disconnect the flat cable assembly that interconnects the motherboard to the A90 assembly.
3. Disconnect the 3 and 13-pin cables from the A90 assembly.
4. Remove the seven nuts that secure the A9 assembly.
5. Remove the four screws that secure the A90 assembly to the A9 assembly, and slide the A90 assembly out.
6. Disconnect the 3-pin cable from the A9 assembly.
7. Disconnect the wires that connect the A90 and A9 assemblies.

3-8-6. A10 ASSEMBLY REMOVAL

First remove the front panel assembly from the 4284A as described in paragraph 3-8-4.

1. Disconnect the flatcable assembly that is connected to the motherboard from the A10 assembly.
2. Remove the two screws, nuts, and washers that secure the A10 assembly to the MEMORY card bezel, and remove the A10 board.

3-8-7. A13 ASSEMBLY REMOVAL

First remove the front panel assembly from the 4284A as described in paragraph 3-8-4.

1. Remove four screws that secure the shield case on which the **WARNING** is printed.
2. Remove the screw that secure the A13 assembly to the back of the shield case.
3. Disconnect the 3-pin cable from the A90 assembly.
4. Disconnect the 3-pin cable from the A91 assembly, and remove the A13 board assembly.

3-8-8. A91 (LCD MODULE) ASSEMBLY REMOVAL

Remove the 4284A's front panel assembly as described in the paragraph 3-8-4.

1. Remove the four screws that secure the shield case on which the **WARNING** label is printed.
2. Remove the 3-pin cable that connects between the A13 assembly and the A91 assembly.
3. Remove the 13-pin cable from the A91 assembly.
4. Remove the 3-pin cable from the A91 assembly, and remove the A91 LCD module assembly.

NOTE

The A91 LCD module assembly consists of its LCD panel and the control circuit. Do not disassemble the LCD module, the LCD panel and the circuit board must remain together as a unit.

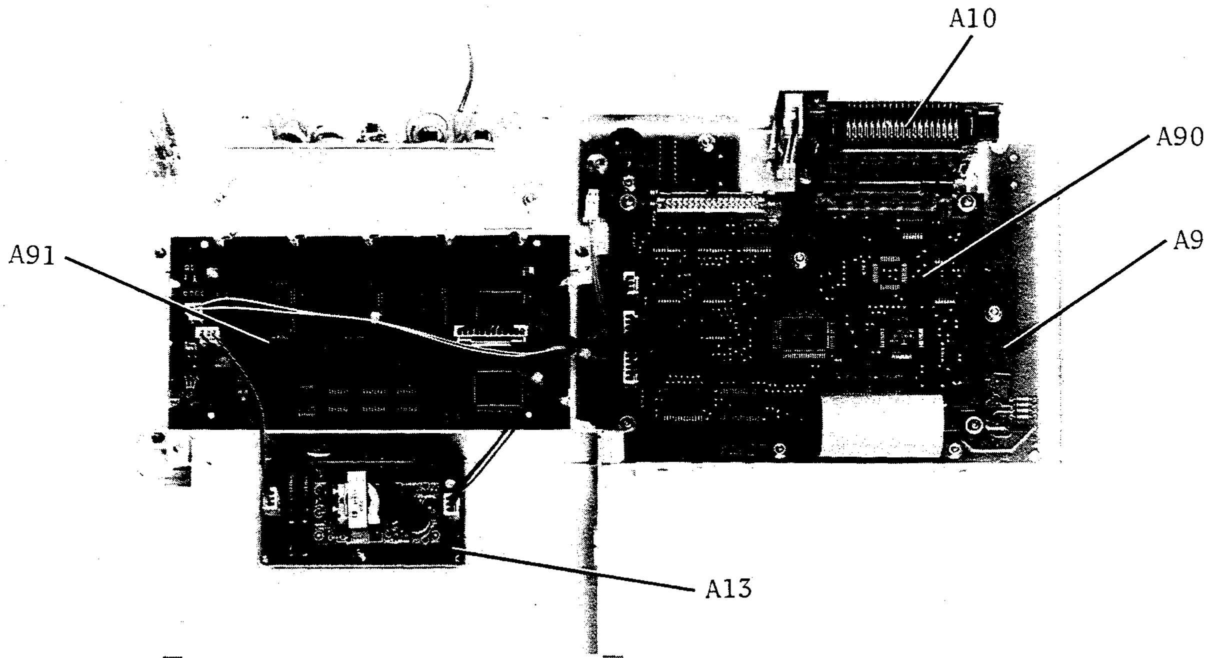


Figure 3-2. A9, A10, A13, A90, or A91 Assembly Removal

3-9. THEORY OF OPERATION

This paragraph discusses about the 4284A's principle of operation, and how the 4284A's high measurement accuracy and its fully automated measurement performance are achieved.

The HP 4284A is composed of five block sections: power supply block section, digital control block section, source block section, transducer (TRD) block section, and vector ratio detector (VRD) section. Each description of each block section is described from the next paragraph, and the 4284A's analog circuit block diagrams (Source, TRD, and VRD sections) are shown at the end of this paragraph.

3-9-1. POWER SUPPLY BLOCK SECTION

The power supply is only A1 board which supplies the dc voltage (+5 V, ±12 V, ±18 V, and -21 V) to each assembly. All service information for the A1 power supply board is given on the SECTION 4. SERVICE SHEET. Figure 3-3 shows the simplified block diagram, and Table 3-10 shows the relationship between the output dc voltages from the A1 board and each assembly.

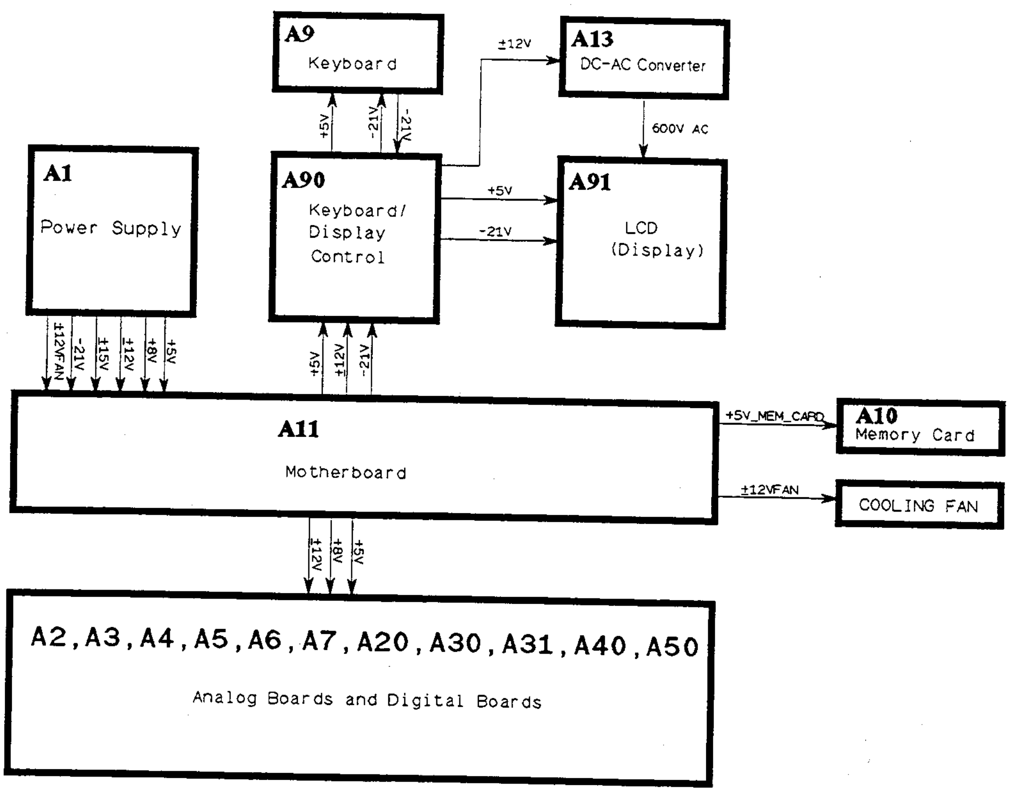


Figure 3-3. Power Supply Simplified Block Diagram

Table 3-10. Relationship between the DCV from A1 and Each Assembly

POWER SUPPLY	A2 to A6	A7	A9	A10	A13	A20 to A50	A90	A91	Cooling FAN
+5 V	X	X	X	X		X	X	X	
+8 V	X								
±12 V	X				X	X	X		
±15 V	X								
−21 V			X				X	X	
±48 V									
±12V FAN									X

3-9-2. DIGITAL CONTROL BLOCK SECTION

The digital control functional group consists of the following boards.

A7	Digital Control (CPU)
A9	Keyboard
A10	Memory Card Interface
A20	HP-IB Interface
A30	Handler Interface (Option 201)
A31	Handler Interface (Option 202)
A40	Scanner Interface (Option 301)
A50	Bias Current Interface (Option 002)

The simplified block diagram is shown below.

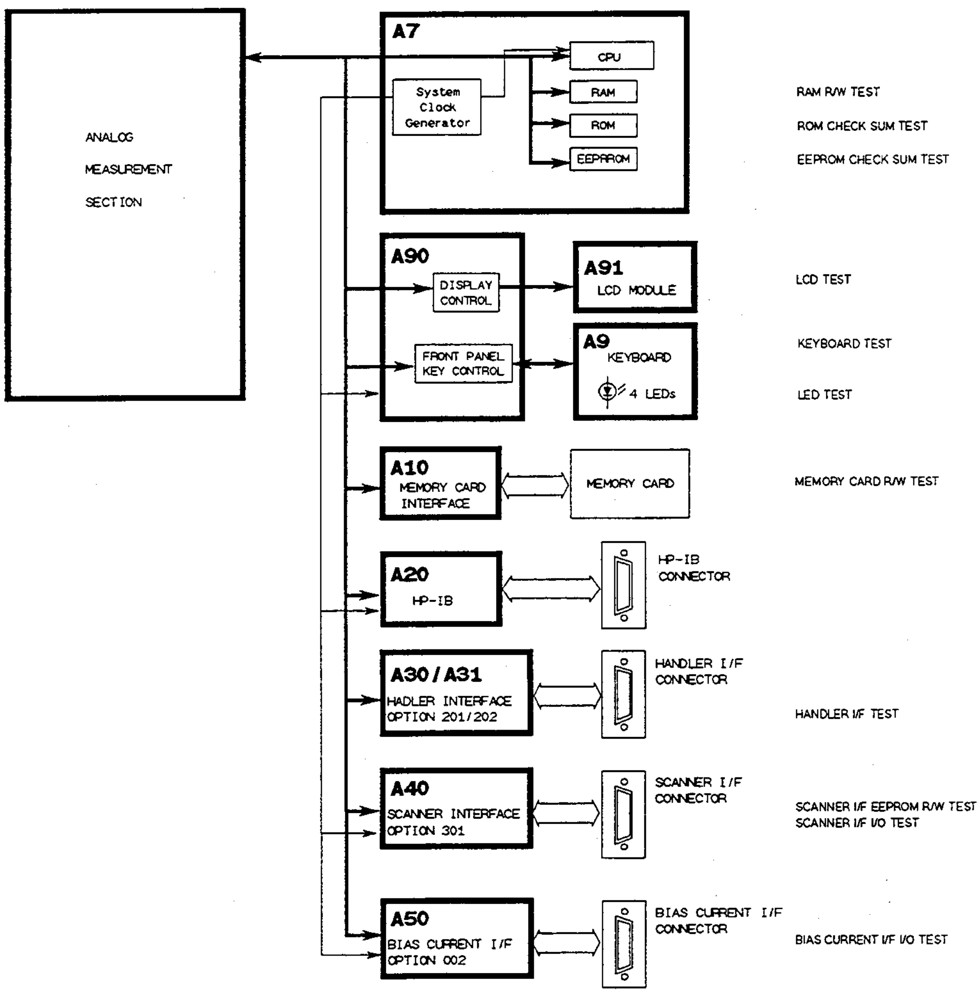


Figure 3-4. Digital Control Block Diagram

Each board is described below.

A7 Digital Control (CPU)

The A7 Digital Control (CPU) contains the main CPU (16-bit micro processor), programmed ROMs, RAMs, EEPROMs, and the local clock generator. This A7 board is the master controller for the HP 4284A.

A9 Keyboard

The A9 keyboard is the front panel keyboard. LED indicators, beeper, and the **CONTRAST** adjustment resistor are on the A9 board.

A10 Memory Card Interface

The A10 memory card interface board is the memory card socket board.

A20 HP-IB Interface

The A20 HP-IB interface board controls the handshake between the micropocessor and external HP-IB controller.

A30/A31 Handler Interface (Option 201/202)

The A30/A31 handler interface board interfaces between the HP 4284A and the external handler.

A40 Scanner Interface (Option 301)

The A40 scanner interface board interfaces between the HP 4284A and the external scanner. The A40 board has two EEPROMs for storing 128 sets of OPEN/SHORT/LOAD correction data at each three frequencies.

A50 Bias Current Interface (Option 002)

The A50 bias current interface board is used to control the HP 42841A.

3-9-3. SOURCE BLOCK SECTION

The source block section is composed of the A4 high power amplifier/dc bias and the A5 signal source boards. The A4 board is only installed for the Option 001.

The A5 signal source board generates the AC voltage (5 mVrms to 1 Vrms), and also generates 1.5V/2.0V DC voltages. The A5 signal source consists of three crystal oscillators, the programmed N divider, the quasi-sine wave generator, the attenuator, the D-A Converter, the dc bias voltages (1.5 V/2.0 V), the output amplifier, and the source resistor. (Refer to Figure 3-5.)

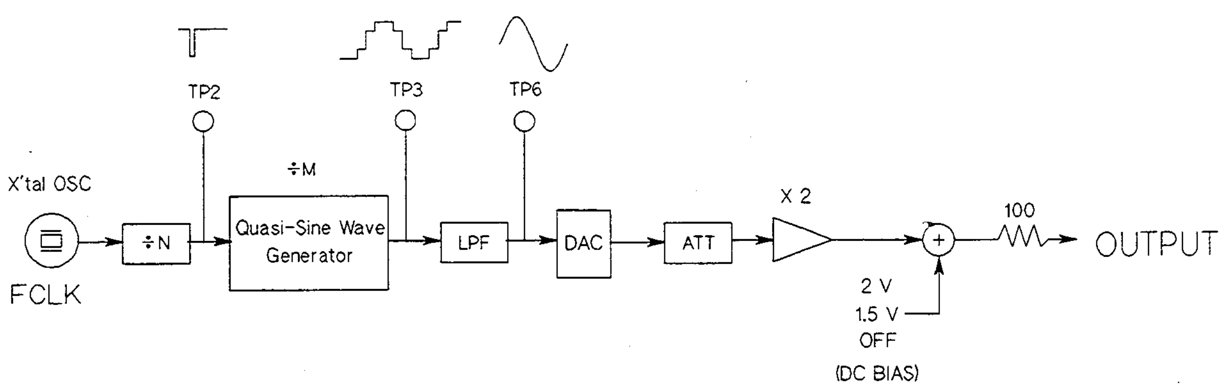


Figure 3-5. Signal Source (A5) Simplified Block Diagram

The crystal oscillators are 19.2 MHz, 16.0 MHz, and 15.36 MHz. One of three crystal oscillators (FCLK) is selected and the output signal is divided by N using the programmed N divider. The divided signal is applied to the quasi-sine wave generator which generates a digital sinewave (staircase waveform). The digital sinewave's frequency is the same as the output test frequency. So the available test frequencies (F) are caluculated using the following fomula.

$$F = FCLK / (N \times M)$$

Where,

FCLK: 19.2 MHz, 16.0 MHz, 15.36 MHz
N: 2 to 4095 (integer)
M: 8, 16, 32, 64, 128, 256

The digital sinewave is filtered by the LPF, and the filtered sine wave is input to the D-A converter (DAC) as a voltage reference. So the 4284A covers various test signals with a high resolution by using both the DAC and the attenuator.

The A4 high power amplifier/dc bias board generates the DC output voltage using the DAC, and also amplifies the AC output signal from the A5 board. The A4 high power amplifier/dc bias board consists of the reference voltage, the D-A converter, the attenuator, the power amplifier (x 10), two switching relays. (Refer to Figure 3-6.)

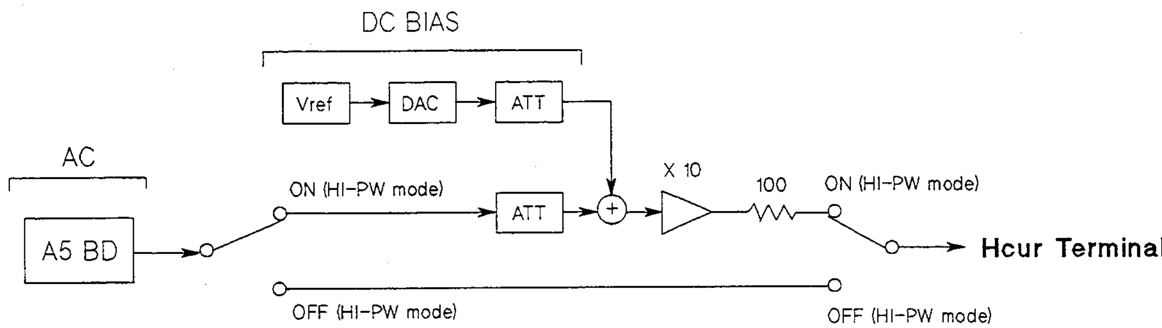


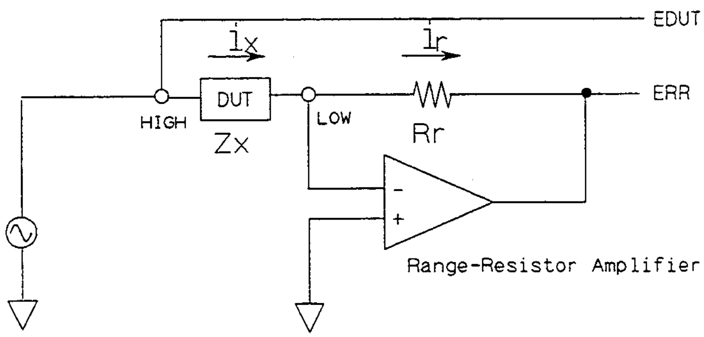
Figure 3-6. High Power Amplifier/DC Bias (A4) Simplified Block Diagrams

The reference voltage (Vref) is ±5 V whose sign depends on the polarity of the dc bias setting. The Vref output is applied to the D-A converter (DAC). The output from the DAC is attenuated by the attenuator, and the attenuated dc bias signal is added to the ac signal from the A5 board. The added signal is amplified (× 10), and is output to the Hcur Terminal.

In the case of the 4284A with the Option 001, you can select the high power mode (ON/OFF) which swiches two relays.

3-9-4. TRANSDUCER BLOCK SECTION

The HP 4284A employees the current-to-votlage coverter as a ammeter. See Figure 3-7. The current through the DUT is detected by a current-to-voltage (I-V) converter using a resistor (Range resistor, RR) in the feedback circuit. The I-V converter generates a current flow through the range resistor equal to the current through the DUT. Therefore, the output voltage of the I-V converter is equal to the product of the current through the DUT and the range resistor value. Accordingly, the impedance is calculated using the voltage across the DUT, the output voltage of the I-V converter, and the value of the range resistor. Then the potential at the LOW terminal is approximately zero (the feedback node is at virtual ground), thus, the range resistor value has no effect on the current through the DUT.



$$\therefore i_x = \frac{EDUT}{Zx} = \frac{ERR}{Rr} \qquad \therefore Zx = Rr \times \frac{EDUT}{ERR}$$

Figure 3-7. I-V Converter

3:Assembly Service Informations

The auto barance bridge circuitly used in the 4284A ensures that the vector voltage across the feedback resistor will be an accurate proportional representation of the current through the device under test. The basic principle of the auto-balance-bridge circuit is explained in terms of the two oscillator model illustrated in Figure 3-8.

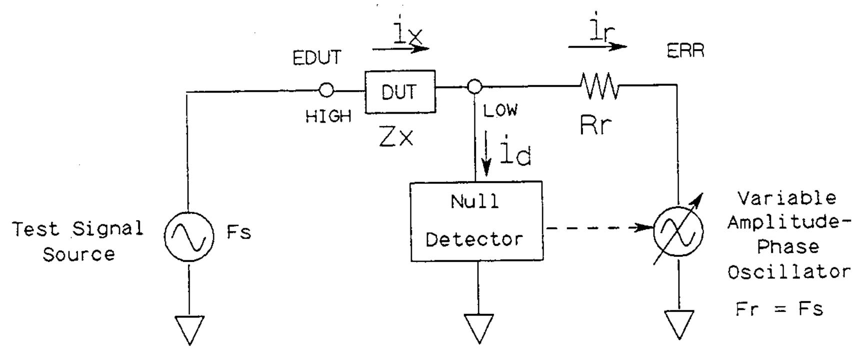


Figure 3-8. Two Oscillators of The Auto Balance Bridge

Currents $\mathbf{i}_x$ and $\mathbf{i}_r$ can be balanced by controlling the output of the valiable amplitude phase oscillator as follows. Firstly, the null detector detects the difference ($\mathbf{i}_d$) between the current trough the DUT ($\mathbf{i}_x$) and the current through the range resistor ($\mathbf{i}_r$). The unbalance current ($\mathbf{i}_d$) which has the information required to balance the bridge, is output to the feedback control circuit for the variable amplitude phase oscillator. After the variable amplitude phase oscillator ($\mathbf{e}_r$) is adjusted, the $\mathbf{i}_d$ is equal to zero (0). So finally the $\mathbf{i}_x$ is equal to the $\mathbf{i}_r$, and the impedance of the DUT is calculated as follows.

$$\therefore i_x = \frac{EDUT}{Zx} = \frac{ERR}{Rr} \qquad \therefore Zx = Rr \times \frac{EDUT}{ERR}$$

The actual auto balance bridge circuit is composed of the A2 modulator and A3 range resistor boards. The auto balance bridge consists of a null detector, a vector generator, and a feedback resistor (range resistor).

The null detector consists of a current-to-voltage (I-V) converter, a phase detector, and an integrator. An I-V converter is used to detect difference between the device under test and the feedback resistor, and outputs this difference as a proportional error voltage. A phase detector and an integrator covert the error voltage into a dc voltage proportinal to the orthogonal vector components.

The vector generator consists of two amplitude modulators, a 90° phase shifter, and a summing amplifier. The reference signal from the test oscillator is amplitude modulated using the null detector's dc error voltage output. When the error voltage from the null detector goes negative, the phase of the output signal from the vector generator shifts 180°. The 0° phase component of the error voltage is fed into the input of the modulator and this 0° phase component modulated output of the modulator is ded directly into the input of the summing amplifier. The 90° phase component modulated output of the modulator is fed into a 90° phase shifter before being fed into the summing amplifier. The output voltage of the summing amplifier is fed back through the range resistor to cancel the error current, thereby keeping the bridge balanced.

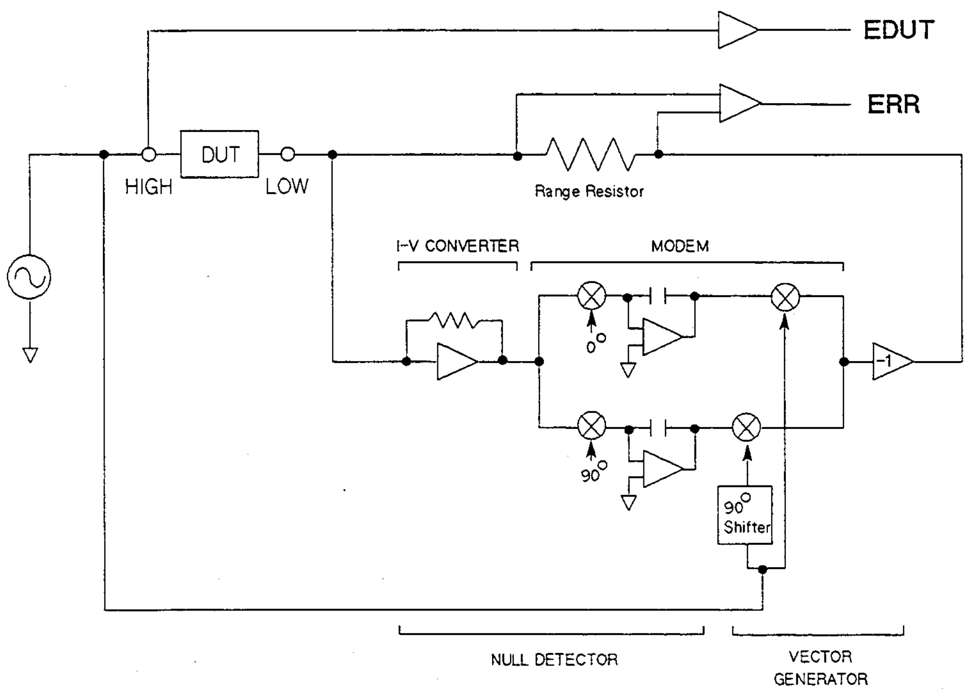


Figure 3-9. Auto Balance Bridge

3:Assembly Service Informations

3-9-5. VECTOR RATIO DETECTOR SECTION

The vector ratio detector is the A6 board, and it consists of the phase sensitive detector, the detection phase generator, and the A-D (Analog-to-digital) converter.

The phase sensitive detector detects the ERR voltage and the EDUT voltage using 0° and 90° reference signals from the detection phase generator, and outputs the 0° components of the ERR and EDUT voltages and the 90° components of the ERR and EDUT voltages.

The A-D converter coverts each 0° and 90° components to digital signals. After that, each parameter's value is calculated by using these digital values.

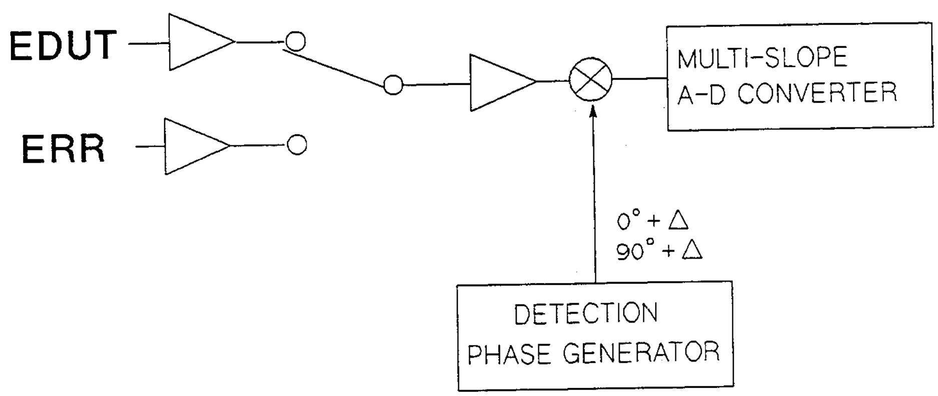


Figure 3-10. Vector Ratio Detector

ANALOG SECTION BLOCK DIAGRAM (STD)

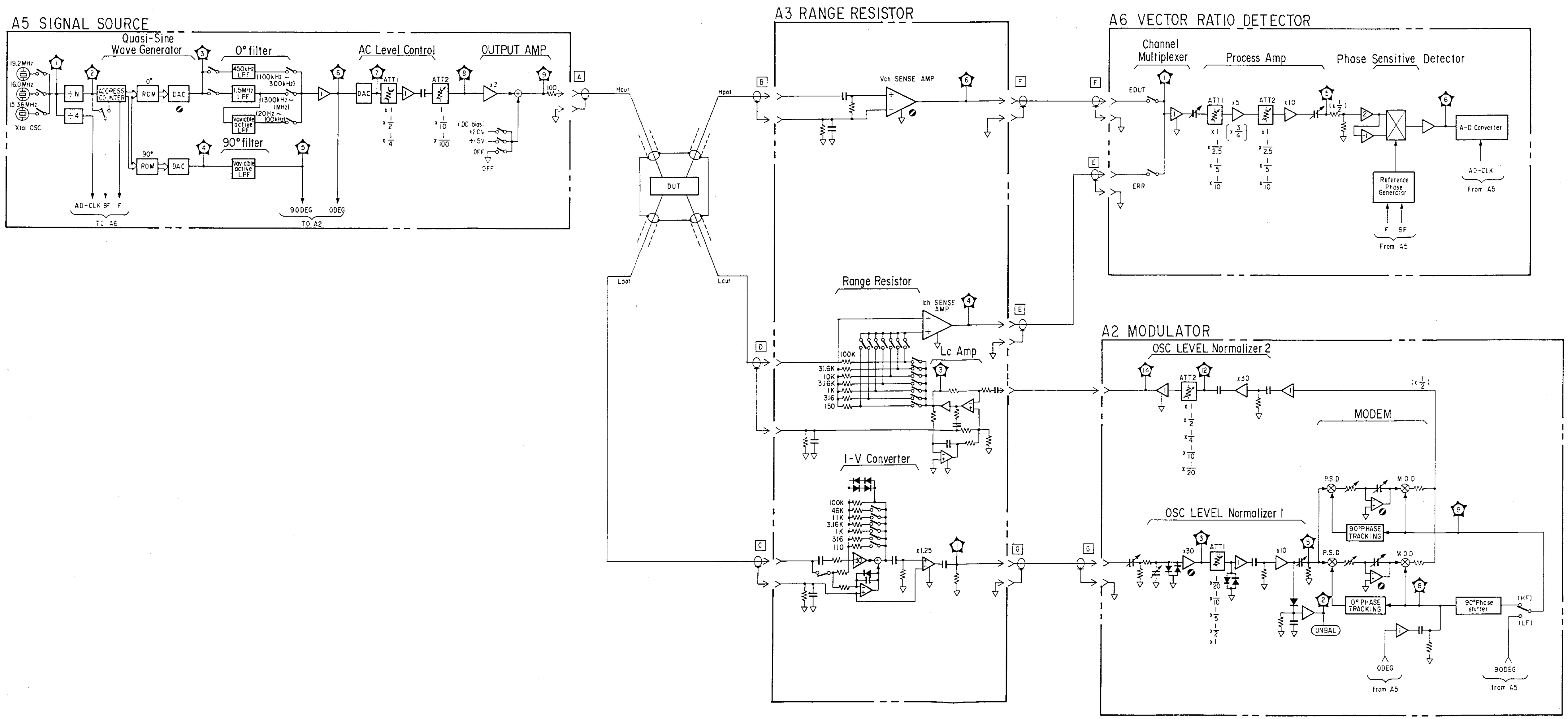


Figure 3-11. Analog Section Block Diagram (Std.)

ANALOG SECTION BLOCK DIAGRAM (OPT.001)

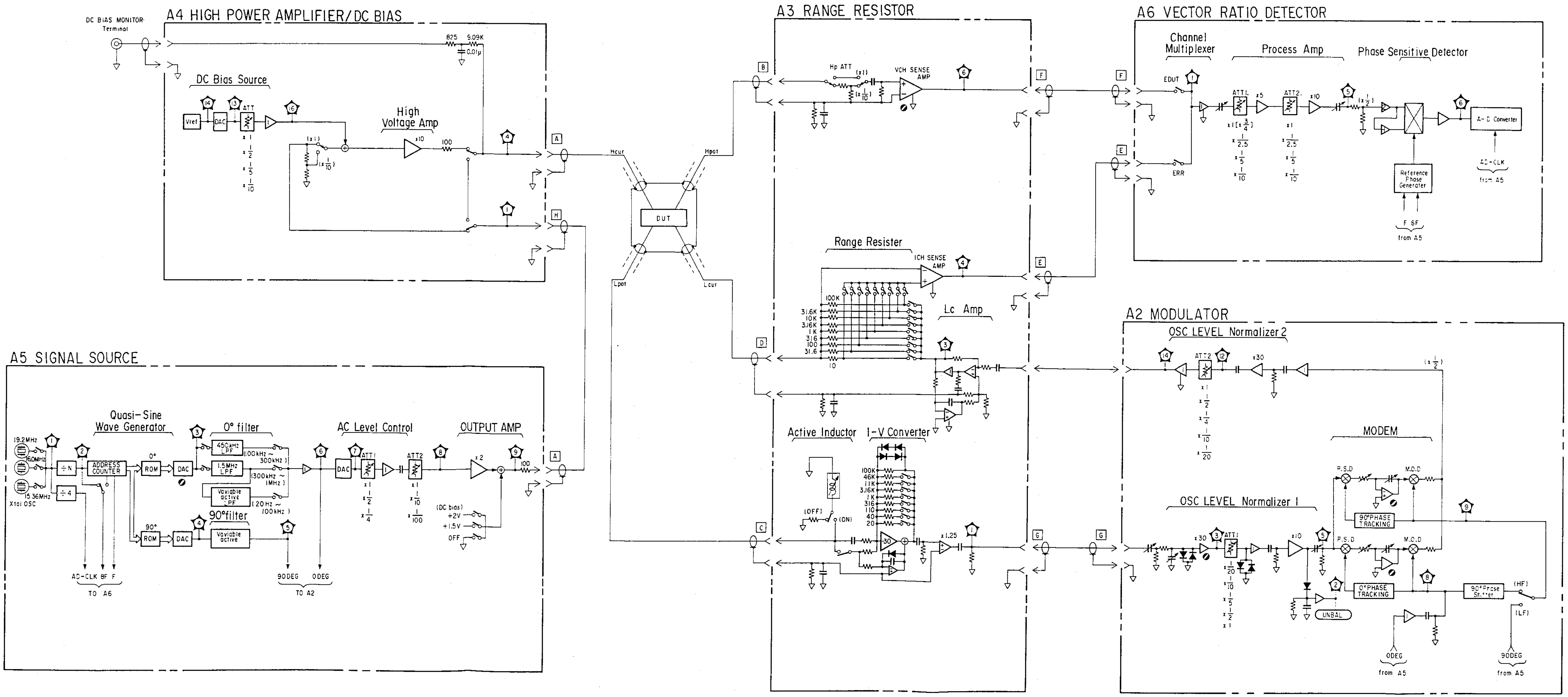


Figure 3-12. Analog Section Block Diagram (Opt.001)

3-10. FAULTY BOARD ISOLATION

When repairing the HP 4284A, firstly you must find the faulty board. This paragraph provides the information for isolating the faulty board.

3-10-1. SELF TEST

Self tests are the 4284A's special functions used for making troubleshooting the digital control group. The 4284A's self tests can be categorized into three types, (1) power-on self test, (2) self test selected with softkeys, and (3) self test selected by a bit switch.

(1) Power on self test

Every time the 4284A is turned on it performs a power-on self test as part of the power on sequence. The 4284A performs the following self tests at power-on.

- ROM check sum test
- RAM R/W test
- EEPROM check sum test

If the power-on self test fails, one of the error messages listed in Table 3-11 will be displayed.

Table 3-11. Error Messages

Error Message	Description
RAM TEST ERROR	The RAM R/W test failed.
ROM CHECK SUM ERROR NO=XX	The check sum of one of the programmed ROMs on the A7 board is incorrect. The ROM number with this message is shown on A7 service sheet, SECTION 4.
SYSTEM DATA CSUM ERROR	The check sum of the data on the SYSTEM CONFIG page in EEPROMs on the A7 board is incorrect.
CORR DATA CSUM ERROR	The check sum of the data on the CORRECTION page in EEPROMs on the A7 board is incorrect.
CALIB DATA CSUM ERROR	The check sum of the calibration data in EEPROMs on the A7 board is incorrect.
SCANNER DATA CSUM ERROR	The check sum of the correction data for the multi correction in EEPROMs on the scanner I/F board (A40) is incorrect.

Also Every time the HP 4284A turned on, the power on sequence (for example, initializes the timer on A7) is performed. This power on sequence is checked by watching the LED array (A7DS3, A7DS4). See below.

LED Pattern (1 = ON 0 = OFF)

Left 1	2	3	4	5	6	7	Right 8	Task
X	X	X	X	X	X	X	X	Clears memory card read/write flip-flop
X	X	X	X	X	X	X	X	Turns off memory card power supply
1	1	1	1	1	1	1	1	LED test
1	0	0	0	0	0	0	0	LED test
0	1	0	0	0	0	0	0	LED test
0	0	1	0	0	0	0	0	LED test
0	0	0	1	0	0	0	0	LED test
0	0	0	0	1	0	0	0	LED test
0	0	0	0	0	0	1	0	LED test
0	0	0	0	0	0	0	1	LED test
0	0	0	0	0	0	0	0	LED test
1	0	0	0	0	0	0	0	Initializes LCD controller
0	1	0	0	0	0	0	0	Initializes timer on A7
1	1	0	0	0	0	0	0	Initializes timer on A90
0	0	1	0	0	0	0	0	Initializes A90
1	0	1	0	0	0	0	0	Check the bit switch (A7S3)
0	1	1	0	0	0	0	0	Initializes timer on the A-D converter
1	1	1	0	0	0	0	0	Initializes PIA chip on A30 or A31
0	0	0	1	0	0	0	0	Initializes PIA chip on A40
1	0	0	1	0	0	0	0	Clears all interrupt signal
1	0	0	0	0	0	0	0	RAM read/write test
1	0	0	0	0	0	0	0	Clears RAM
1	0	0	0	0	0	0	0	Displays "Copyright" message
1	0	0	0	0	0	0	0	ROM check sum test
1	0	0	0	0	0	0	0	EEPROM check sum test
1	0	0	0	0	0	0	0	EEPROM check sum test for A40 (Option 301 only)
1	0	0	0	0	0	0	0	Starts the measurement

(2) Self test selected by softkeys

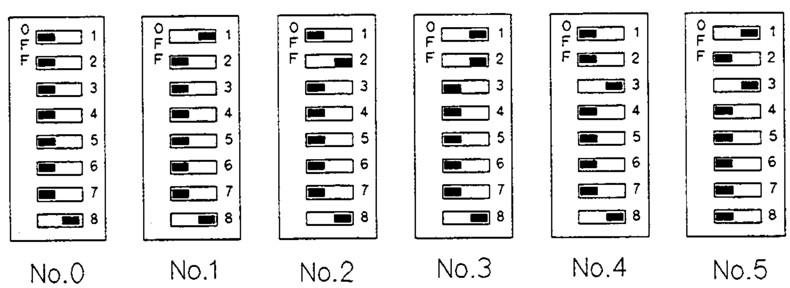
Softkey selected self tests are shown below, and each self test is described in SECTION 5 of the operation manual.

1. Memory card R/W test
2. LED display test
3. LCD display test
4. Handler I/F test
5. Scanner I/F EEPROM R/W test
6. Scanner I/F I/O test
7. Bias current I/F I/O test

(3) Self test selected by the bit switch

The following self tests can be performed by setting the A7S3 bit switch.

Table 3-12. Bit Switch Selected Self Test



No.	Description
0	This self test displays the ROM check sum on the LCD display.
1	This self test performs the RAM read/write test.
2	This self test performs the EEPROM read/write test. The time required for completing this test is approximately 17 minutes.
3	This self test perform the front panel keyboard test. Pressed key code and its abbreviated name will be displayed.
4	This self test initializes the EEPROM. This self test must be performed when the EEPROM is being replaced.
5	This self test initializes the scanner interface's EEPROM. This self test must be performed when the scanner interface's EEPROM is being replaced.

NOTE

Each bit of the A7S3 usually uses the digital interface selection. So after performing the bit switch selected self test, the A7S3 switch must be set properly. For more details, refer to the A7 board service sheet, SECTION 4.

3-10-2. FAULTY BOARD ISOLATION PROGRAM

To isolate a faulty board the service program must be used. This program isolates the faulty board in a dialoge style between the user and the controller.

The program disc for performing the faulty board isolation is supplied as follows.

5.25 inches floppy disc	P/N 04284-65002
3.5 inches floppy disc	P/N 04284-65009

Software Environment: The faulty board isolation program is written in HP BASIC. HP BASIC 5.0 (and above version) must be required to run this program in addition to the following several binary files.

HP-IB, KBD, GRAPH, GRAPHX, PDEV, IO

Making a Back-up Copy: This program disc stores the HP-IB address data. So this disc is not write-protected. To protect the program, make a back-up copy using the master disc.

File Name: There are two files in Table 3-13 are stored in the faulty board isolation program disc.

Table 3-13. File Name

File Name	Description
SVC_4284A	Trouble Isolation Main Program
HP_ADRS	HP-IB Address Data

Flow-chart: The basic flowchart of the faulty board isolation program is shown in Figure 3-14.

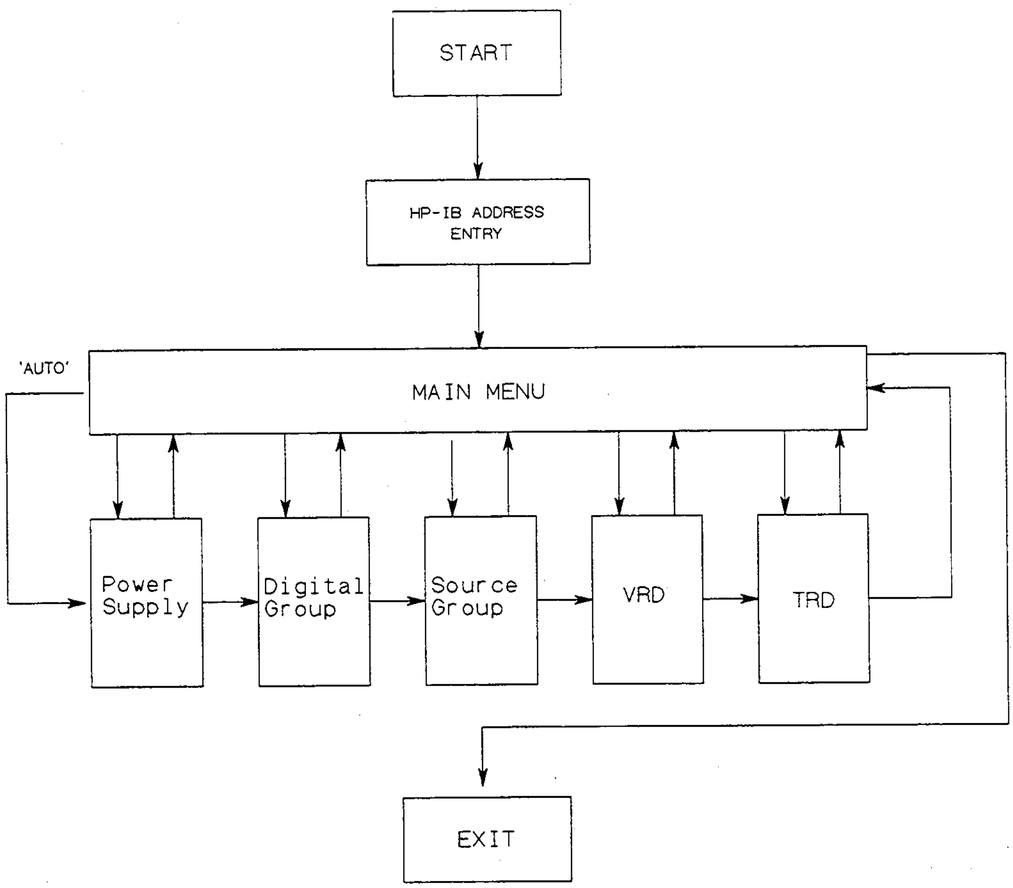


Figure 3-14. Flow-chart

NOTE

When either the power supply group trouble isolation or the digital group trouble isolation is performed, you don't have to connect the HP-IB cable between the controller and the HP 4284A. Check the 4284A in accordance with the message on the controller's screen.

3-10-2. FAULTY BOARD ISOLATION PROCEDURE

This paragraph provides the procdures for isolating the faulty board. Required equipment are listed in Table 1-1, SECTION 1.

Perform the following procedure to isolate the faulty board.

1. Connect the HP-IB cable between the HP-IB connectors on the 4284A's rear panel and on the controller's rear panel, and connect the HP-IB cable between the HP-IB connectors on the 4284A's rear panel and on the HP 3458A's rear panel. Figure 3-14 shows the setup.

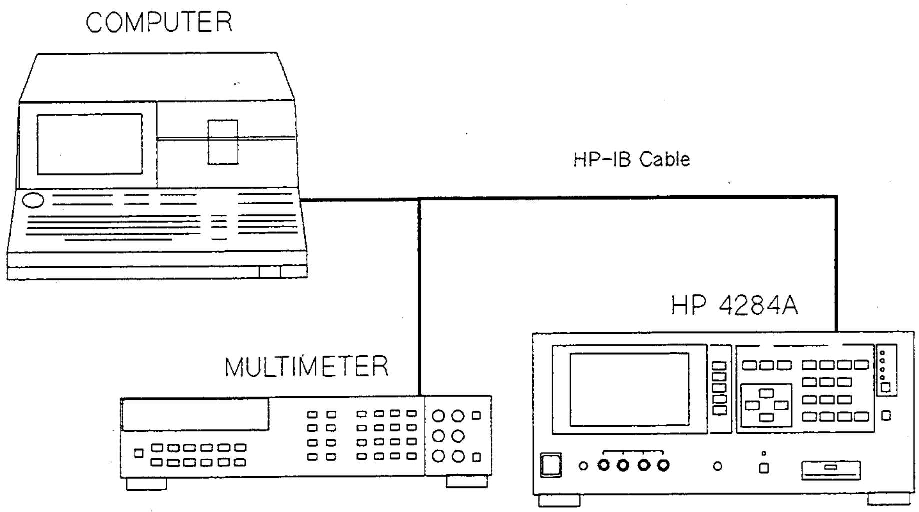


Figure 3-14. Faulty Board Isolation Program Setup

2. Boot up BASIC and load the necessary binary files in the controller.
3. Load the faulty board isolation program in the controller, the file name is "SVC_4284A".
4. Press the controller's **RUN** key. After two minutes, the nessecary equipment list will be displayed on the controller's screen. (The necessary equipment is also listed in Table 1-1, SECTION 1.)
5. Press the controller's **'NextStep'** softkey. The HP-IB address list will be displayed on the controller's screen.
6. Set the 4284A's HP-IB address and 3458A's HP-IB address using the proper controller softkeys, and press the controller's **'NextStep'** softkey. If you don't get the 4284A's HP-IB address due to a problem with the 4284A, press the **'NextStep'** softkey without entering the 4284A's HP-IB address.
7. The main menu will be displayed on the controller's screen as follows.

```
HP 4284A FAULTY BOARD ISOLATION PROGRAM
MAIN MENU

f1: Auto Sequence Trouble Isolation (f2 to f6)

f2: Power Supply Trouble Isolation
f3: Digital Group Trouble Isolation
f4: Source Group Trouble Isolation
f5: Vector Ratio Detector Trouble Isolation
f6: Transducer Trouble Isolation

f8: Exit this program



Select using the softkeys


|          |Auto     |Power    |Digital  |Source   |
| VRD      |TRD      |         |Exit     |         |
```

Figure 3-15. Main Menu

8. Use the following information to select the softkeys , and perform the trouble isolation procedures according to messages on the controller's display.

Table 3-14. Main Menu Softkeys

Softkey	Description
f1: **'Auto'**	Used to check all groups, and to isolate the faulty board. The checking order is shown in Figure 3-13.
f2: **'Power'**	Used to check the power supply group, and to isolate the faulty board in the power supply group. The items checked in the power supply group are as follows: • Cooling fan • Output dc voltages on the A1 board • Neon lump on the A13 board • Fuses on the A1 board • VOLTAGE SELECTOR switch and Fuse on the rear panel
f3: **'Digital'**	Used to check the digital group (A7, A20 to A50), and to isolate the faulty board in the digital group. The items checked in the digital group are as follows: • Power-on self test • Each performance test for each digital interface
f4: **'Source'**	Used to check the source group (A4, A5), and to isolate the faulty board in the source group. The items checked in the source group are as follows: • Test frequency test • Signal level/Level monitor test • DC bias level test
f5: **'VRD'**	Used to check the A6 Vector Ratio Detector (VRD). The items checked in the VRD are as follows: • Hpot Buffer (A3) • A-D Converter • Prosess amplifier and phase sensitive detector
f6: **'TRD'**	Used to check the transducer (TRD), and isolate the faulty board in the TRD (A2, A3). The items checked in the TRD are as follows: • 90° phase shifter on A2 • UNBAL detector on A2 • Hpot buffer on A3 • MODEM/Normalizer on A2 • Lcur gain amplifier on A3 • Range resistor/I sense amplifier on A3 • I-V converter on A3 • Bias Current Isolation (Active Indactor) on A3
f8: **'Exit'**	Used to exit this program.

NOTE

You can only select the **'TRD'** softkey after you have checked the other groups.

NOTES

SECTION 4

SERVICE SHEETS

4-1. INTRODUCTION

This section contains a service sheet for each of the HP 4284A's PC board assemblies. Each service sheet is organized into six parts: Circuit Description, Troubleshooting Aids, Board Connector Pin Assignments, Replaceable Parts List, Component Location Drawing, and Schematic Diagram.

4-2. CIRCUIT DESCRIPTION

The circuit description gives a detailed functional circuit description of each board.

4-3. TROUBLESHOOTING AIDS

The troubleshooting aids provide information to help you troubleshoot problems in the HP 4284A. Usually the troubleshooting aids consists of a list of jumpers, a list of test points, and troubleshooting information. The jumper list shows the strapping configuration for each jumper. The test point list gives a description of the signal at each test point. The troubleshooting information includes waveforms for troubleshooting the board, and the measurement setup for viewing the waveform is listed next to the waveform figure, refer to Figure 4-1.

Setting up the oscilloscope:

(1) Set the oscilloscope inputs to DC coupled (1 MΩ).

(2) The settings (using a 1:1 probe) for channel A and B, and the time base setting are displayed with the waveform, refer to Figure 4-1. When a 10:1 divider probe is used, the channel A and B settings must be multiplied by 10.

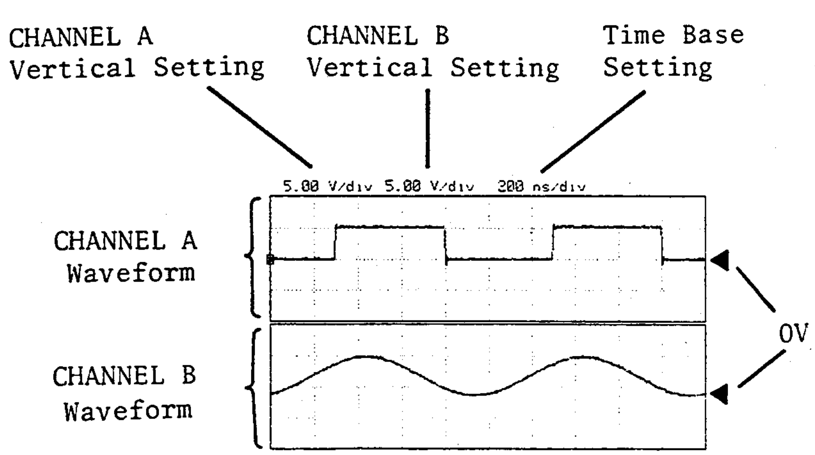


Figure 4-1. Oscilloscope Setup

4-4. BOARD CONNECTOR PIN ASSIGNMENT

The pin assignments for each board are provided with the component locations using the names listed in Table 4-1.

Table 4-1. Signal Name Used for Pin Assignments

Name	Description
AD_CLK	Clock signal for A-D converter
A1 to *A20*	Address bus lines
/ACS0 to */ACS7*	Analog board (card) select signal
ANA1 to *ANA6*	Address bus lines for the analog boards
AND0 to *AND7*	Data bus line for controlling the analog boards
/ANLDS	Analog Board Data Strobe Signal
ANR/W	Data Read/Write Signal
/AS	Address strobe signal
A1 to *A20*	Address bus line
/BIAS	Bias current I/F access signal
/CARD_LDS	Memory card lower data strobe
/CARD_R/W	Memory card read/write signal
D0 to *D15*	Data Bus Line for the digital boards
/DTAC	Data acknowledge signal
/EOC_INT	Interrupt signal for A-D End Of Conversion
F	Test Frequency Signal
/HALT	Halt signal
/HANDLER	Handler interface access signal
/HDL_TRG_INT	Trigger interrupt signal from Handler Interface
/ID0 to */ID7*	Board identification signal
/INT_FRM_STD_IF	Interrupt from the HP-IB interface
/INT_TO_STD_IF	Interrupt to the HP-IB interface
KBD_INT	Interrupt from the keyboard
/KEY_DSP_CTL	Keyboard and display control signal
/KEY_LOCK_INT	Keylock interrupt signal from Handler Interface
/LDS	Lower data strobe
/LGND	Logic circuits ground line
LOC_0	Local (0°) signal
LOC_90	Local (90°) signal
/MEM_CARD	Memory card access signal
NULL_OUT	Null detector output signal
/POW_FAIL	*/ALARM* signal to the handler interface
/REAR_TRG_INT	Trigger interrupt signal from the external trigger connector on the rear panel
/RESET	Reset signal
R/W	Read/Write signal
/STD_IF	HP-IB access signal
/SCANNER	Scanner interface access signal
/SCANNER_INT	Interrupt signal from the scanner interface
/UDS	Upper data strobe
/VMA	Valid memory access signal for CPU
/VPA	Valid peripheral signal
8F	8 x F (test frequency) signal
+12VFAN	+12 V for the cooling fan
-12VFAN	-12 V for the cooling fan
+5V_MEM_CARD	+5 V for the memory card

4-5. REPLACEABLE PARTS LIST

The replaceable parts list provides information about the replaceable parts.

4-5-1. ABBREVIATIONS

Table 4-2 lists the abbreviations used throughout this manual. In some cases, three forms of the same abbreviation are used: all upper case, all lower case, and mixed upper and lower case. Abbreviations used in the parts lists are always upper case, and mixed upper- and lower-case letters.

Table 4-2. List of Reference Designators and Abbreviations

REFERENCE DESIGNATORS

A	= assembly
B	= motor
BT	= battery
C	= capacitor
CP	= coupler
CR	= diode
DL	= delay line
DS	= device signaling (lamp)
E	= misc electronic part
F	= fuse
FL	= filter
J	= jack
K	= relay
L	= inductor
M	= meter
MP	= mechanical part
P	= plug
Q	= transistor
R	= resistor
RT	= thermistor
S	= switch
T	= transformer
TB	= terminal board
TP	= test point
U	= integrated circuit
V	= vacuum, tube, neon bulb, photocell, etc.
VR	= voltage regulator
W	= cable
X	= socket
Y	= crystal

ABBREVIATIONS

A	= amperes
A. F. C.	= automatic frequency control
AMPL	= amplifier
B. F. O.	= beat frequency oscillator
BE CU	= beryllium copper
BH	= binder head
BP	= bandpass
BRS	= brass
BWO	= backward wave oscillator
CCW	= counter-clockwise
CER	= ceramic
CMO	= cabinet mount only
COEF	= coefficient
COM	= common
COMP	= composition
COMPL	= complete
CONN	= connector
CP	= cadmium plate
CRT	= cathode-ray tube
CW	= clockwise
DEPC	= deposited carbon
DR	= drive
ELECT	= electrolytic
ENCAP	= encapsulated
EXT	= external
F	= farads
f	= femto = 10^{-15}
FH	= flat head
FIL H	= fillister head
FXD	= fixed
G	= giga = 10^{9}
GE	= germanium
GL	= glass
GRD	= ground(ed)
H	= henries
HEX	= hexagonal
HG	= mercury
HR	= hour(s)
Hz	= hertz
IF	= intermediate freq.
IMPG	= impregnated
INCD	= incandescent
INCL	= include(s)
INS	= insulation(ed)
INT	= internal
k	= kilo = 1000
LH	= left hand
LIN	= linear taper
LK WASH	= lock washer
LOG	= logarithmic taper
LPF	= low pass filter
m	= milli = 10^{-3}
M	= meg = 10^{6}
MET FLM	= metal film
MET OX	= metallic oxide
MFR	= manufacturer
MINAT	= miniature
MOM	= momentary
MTG	= mounting
MY	= "mylar"
n	= nano = 10^{-9}
N/C	= normally closed
NE	= neon
NI PL	= nickel plate
N/O	= normally open
NPO	= negative positive zero (zero temperature coefficient)
NPN	= negative-positive-negative
NRFR	= not recommended for field replacement
NSR	= not separately replaceable
OBD	= order by description
OH	= oval head
OX	= oxide
P	= peak
PC	= printed circuit
p	= pico = 10^{-12}
PH BRZ	= phosphor bronze
PHL	= Phillips
PIV	= peak inverse voltage
PNP	= positive-negative-positive
P/O	= part of
POLY	= polystyrene
PORC	= porcelain
POS	= position(s)
POT	= potentiometer
PP	= peak-to-peak
PT	= point
PWV	= peak working voltage
RECT	= rectifier
RF	= radio frequency
RH	= round head or right hand
RMO	= rack mount only
RMS	= root-mean square
RWV	= reverse working voltage
S-B	= slow-blow
SCR	= screw
SE	= selenium
SECT	= section(s)
SEMICON	= semiconductor
SI	= silicon
SIL	= silver
SL	= slide
SPG	= spring
SPL	= special
SST	= stainless steel
SR	= split ring
STL	= steel
TA	= tantalum
TD	= time delay
TGL	= toggle
THD	= thread
TI	= titanium
TOL	= tolerance
TRIM	= trimmer
TWT	= traveling wave tube
μ	= micro = 10^{-6}
VAR	= variable
VDCW	= dc working volts
W/	= with
W	= watts
WIV	= working inverse voltage
WW	= wirewound
W/O	= without

0001-9700

4-5-2. REPLACEABLE PARTS LISTS

Table 4-3 lists the names and addresses of the manufacturers identified by Mfr. Code in the parts lists. In most cases the information given for each part includes the following information:

1. HP part number.
2. Quantity used in the assembly -- given once -- at the first occurrence of the part number.
3. Five-digit code representing the typical manufacturer.
4. Manufacture's part number.

Table 4-3. Component Manufactures

Mfr Code	Manufacturer Name	Address	Zip Code
S0545	NEC ELECTRONICS LTD	MTN VIEW CA US	94043
S0562	TOSHIBA CORP	TOKYO JP	
S4013	HITACHI AMERICA LTD	SUNNYVALE CA US	94086
01121	ALLEN-BRADLEY CO INC	EL PASO TX US	79935
01295	TEXAS INSTRUMENTS INC	DALLAS TX US	75265
02768	ITW FASTEX	DES PLAINES IL US	60016
03888	K D I PYROFILM CORP	WHIPPANY NJ	07981
04713	MOTOROLA INC SEMI-COND PROD	PHOENIX AZ US	85008
06665	PRECISION MONOLITHICS INC.	SANTA CLARA CA	95050
07263	FAIRCHILD CORP	MOUNTAIN VIEW CA US	94042
09922	BURNDY CORP	NORWALK CT US	06856
1B546	VARO SEMICONDUCTOR INC	GARLAND TX US	75046
11236	CTS CORP BERNE DIV	BERNE IN US	46711
13606	SPRAGUE ELECTRIC SEMICON DIV	CONCORD NH	03301
14433	ITT SEMICONDUCTORS DIV	TUSTIN CA US	92680
16299	CORNING ELECTRONICS	RALEIGH NC US	27604
19701	MEPCO/CENTRALAB INC	WEST PALM BEACH FL US	33407
24046	TRANSITRON ELECTRONIC CORP	WAKEFIELD MA	01880
24355	ANALOG DEVICES INC	NORWOOD MA US	02062
24546	CORNING ELECTRONICS	SANTA CLARA CA US	95050
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA CA US	95052
27167	CORNING GLASS WORKS (WILMINGTON)	WILMINGTON NC	28401
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE NJ	
32293	INTERSIL INC	CUPERTINO CA CA	95014
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
73138	BECKMAN INDUSTRIAL CORP	FULLERTON CA US	92632
73899	J F D ELECTRONICS CORP	BROOKLYN NY	11219
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA PA	19108
75915	LITTELFUSE INC	DES PLAINES IL US	60016
76381	3M CO	ST PAUL MN US	55144
9N171	UNITRODE CORP	LEXINGTON MA US	02173
91637	DALE ELECTRONICS INC	EL PASO TX US	79936
98291	SEALECTRO CORP	MAMARONECK NY	10544

4-5-3. ORDERING INFORMATION

When ordering a replacement part listed in the Replaceable Parts List, specify the Hewlett-Packard part number and the quantity required, and send the order to the nearest Hewlett-Packard office.

When ordering a part not listed on the Replaceable Parts List, state the full instrument model number and serial number, describe the function of the part, and give the quantity required. Send the order to the nearest Hewlett-Packard office.

4-5-4. DIRECT MAILING ORDERING

Within the United States, Hewlett-Packard supplies parts through a direct mail order system. The advantages of using this system are:

- -- Direct order and shipment from the HP Parts Center in Mountain View, California.
- -- No maximum or minimum on any mail order (there is a minimum order amount for parts ordered through local HP offices when the order requires billing and invoicing).
- -- Prepaid shipping (there is a small handling charge for each order).
- -- No invoices--a check or money order must accompany the order.

Mail order forms and specific ordering information are available through your local HP office. Addresses and telephone numbers are given at the back of this manual.

4-6. COMPONENT LOCATIONS

The component locations provide you with component position information.

4-7. SCHEMATIC DIAGRAMS

The schematic diagram for each board provides you with circuit information. Figure 4-2 shows the symbols used in the schematic diagrams.

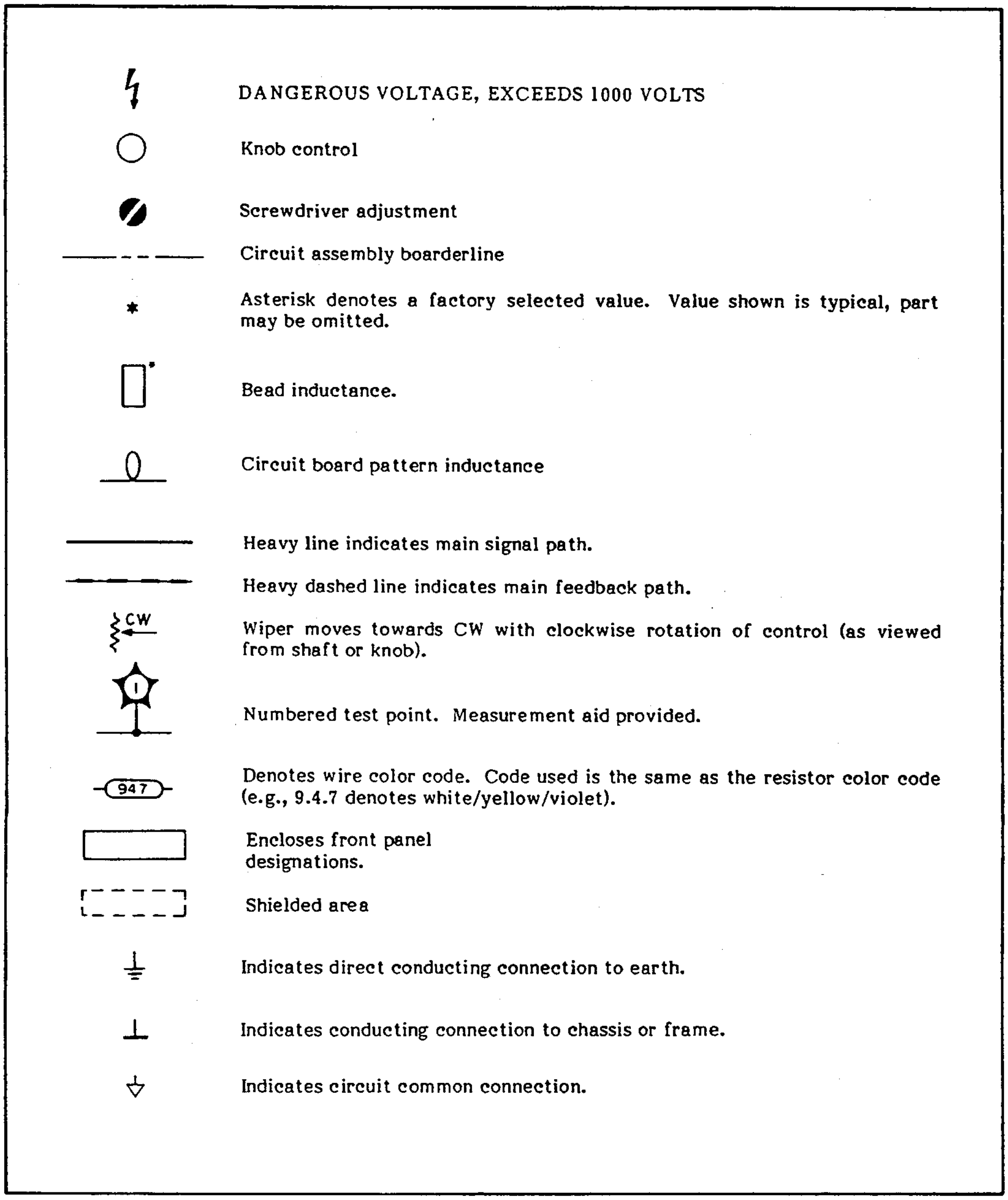


Figure 4-2. Schematic Diagram Symbols

4-8. A1 POWER SUPPIY SERVICE SHEET

4-8-1. CIRCUIT DESCRIPTION

The A1 Power Supply board provides +5 V, +8 V, ±12 V, ±15 V, -21 V, and ±48 V to the A11 Mother Board. The A1 Power Supply board is divided into two sections at transformer A1T3: the primary circuit and the secondary circuit.

The primary circuit consists the following.

1. Primary rectifier
2. Turn-on surge current limiter
3. Slow start circuit
4. Supply voltage controller
5. Switching circuit
6. Shutdown circuit

The secondary circuit consists the following.

1. Secondary rectifier for each output voltage
2. Overvoltage detector

An explanation for each circuit follows.

[Primary Rectifier]

The primary rectifier, composed of A1CR1, A1C2, A1C3, A1C4, and A1C5, rectifies the AC source voltage to supply the unregulated DC voltages. A1CR1 acts as a full wave rectifier when the line voltage selector is set to 220/240 V, and as a voltage doubler when the line voltage selector is set to 100/120 V.

[Surge Current Limiter]

The surge current limiter, composed of A1R1, A1K1, and A1FT1, limits the surge current when the instrument is turned on. A1K1 is activated by the slow start circuit about half a second after the power switch is turned on to by-pass A1R1 (Surge current limit resistor), which protects the primary rectifier from current surges at power up. If A1K1 does not activate, the heat produced by A1R1 will cause thermal fuse A1FT1 to open up.

[**Slow Start Circuit**]

The slow start circuit, composed of A1Q1, A1Q2, A1Q3, A1Q9, and A1Q10, lengthens the rise time of the supply voltage by limiting the maximum switching pulse width at power up. When the voltage from the primary rectifier becomes greater than about 240 V, the slow start circuit is enabled.

[**Supply Voltage Controller**]

A1U2 (supply voltage controller), controls the switching circuit. The switching duty cycle is adjusted by A1R19 (FREQ-ADJ).

[**Switching Circuit**]

The switching circuit used to convert the DC primary voltage to a 40 kHz AC voltage consists of A1Q11, and A1Q12. The duty cycle is the parameter varied to regulate the output voltage, and it is controlled by A1U2 (supply voltage controller), by comparing the 5 V Vref (reference voltage) to the 9 V feedback voltage produced by A1CR21, A1CR22, A1L4, and A1C25.

[**Shutdown Circuit**]

The shutdown circuit, consisting of A1Q6, A1Q7, A1CR18, and A1CR19, stops both the A1U2's oscillator and the switching circuit if one of the following situations occur.

1. The FAN STOP signal form A1U6 is received by the shutdown circuit.
2. The over voltage signal from A1U5 is received by the shutdown circuit.

[**Secondary Rectifier**]

The secondary rectifier rectifies the output of the secondary windings of A1T3 and outputs +5 V, +8 V, ±12 V, ±15 V, -21 V, and ±48 V.

[**Over Voltage Detector**]

A1CR40, A1CR41, A1CR43, A1CR44, A1CR45, and A1CR47 make up the over voltage detector. If any voltage exceeds its limit, the over voltage detector will send a shutdown signal to A1U5 (opto-coupler) which will transfer the signal to the shutdown circuit.

4-8-2. TROUBLESHOOTING AIDS

Table 4-4 shows the troubleshooting waveforms, and Table 4-5 lists the DC output voltage at each test point.

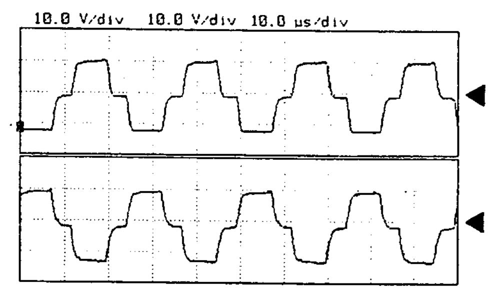
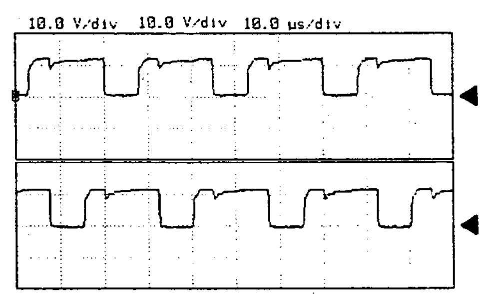
WARNING

DISCONNECT THE POWER CABLE BEFORE WATCHING THE BELOW WAVEFORMS

HP 4284A Setup:

1. Disconnect the power cable.
2. Remove the A1 board.
3. Set A1W1 to the test position.
4. Tie A1TP3 to A1TP10.
5. Supply +12 V DC to A1TP2 referenced to A1TP3.

Table 4-4. Power Supply Troubleshooting Data

HP 4284A Settings	Measurement Setup	Waveform
See Above	CHAN A: A1TP1 CHAN B: A1TP5 TRIG: CHAN A (Negative)	
See Above	CHAN A: A1TP4 CHAN B: A1TP8 TRIG: CHAN A (Negative)	

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Table 4-5. A1 DC Voltage and Test Points

Test Point	Name	Actual DC Voltage
A1TP13	-15V	-16.5 V ±0.7 V
A1TP14	+15V	+16.5 V ±0.7 V
A1TP15	-12V	-12.5 V ±0.5 V
A1TP16	+5V	+5.2 V ±0.2 V
A1TP17	+8V	+8.7 V ±0.4 V
A1TP18	+12V	12.5 V ±0.5 V
	-21V	-21.5 V ±2 V
	+48V	+46 V ±3 V
	-48V	-46 V ±3 V

4-8-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A1 board are listed in Table 4-6.

4-8-4. COMPONENT LOCATIONS

The component locations and pin assignments for the A1 board are shown in Figure 4-3.

4-8-5. SCHEMATIC DIAGRAMS

The A1 board schematic diagram is shown in Figure 4-4.

Table 4-6. A1 Power Supply Replaceable Parts List (1/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1						
A1	04284-66501	0	1	POWER SUPPLY	28480	04284-66501
A1C1	0160-3969	6	2	CAPACITOR-FXD .015UF +-20PF 250VAC(RMS)	28480	0160-3969
A1C2	0180-3253	3	4	CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C3	0180-3253	3		CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C4	0180-3253	3		CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C5	0180-3253	3		CAPACITOR-FXD 470UF+-20% 250VDC AL	28480	0180-3253
A1C6	0160-3969	6		CAPACITOR-FXD .015UF +-20PF 250VAC(RMS)	28480	0160-3969
A1C7	0180-3586	5	1	CAPACITOR-FXD 2200UF+-20% 35VDC AL	28480	0180-3586
A1C8	0160-4835	7	4	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C9	0180-3600	4	5	CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C10	0160-4801	7	1	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A1C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C13	0160-4830	2	2	CAPACITOR-FXD 2200PF +-10% 100VDC CER	28480	0160-4830
A1C14	0160-4830	2		CAPACITOR-FXD 2200PF +-10% 100VDC CER	28480	0160-4830
A1C15	0160-6812	4	2	CAPACITOR-FXD 2.2UF +-10% 250VDC	28480	0160-6812
A1C16	0160-6812	4		CAPACITOR-FXD 2.2UF +-10% 250VDC	28480	0160-6812
A1C17	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C18	0160-4834	6	1	CAPACITOR-FXD .047UF +-10% 100VDC CER	28480	0160-4834
A1C19	0160-6561	0	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
A1C20	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A1C21	0160-4833	5	2	CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A1C22	0180-3583	2	1	CAPACITOR-FXD 10UF+-20% 50VDC AL	28480	0180-3583
A1C23	0160-4833	5		CAPACITOR-FXD .022UF +-10% 100VDC CER	28480	0160-4833
A1C24	0160-3454	4	1	CAPACITOR-FXD 220PF +-10% 1KVDC CER	28480	0160-3454
A1C25	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
A1C26	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
A1C27	0180-3597	8	1	CAPACITOR-FXD 47UF+-20% 25VDC AL	28480	0180-3597
A1C28	0160-3456	6	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A1C29	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C30	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C31	0180-3600	4		CAPACITOR-FXD 33UF+-20% 25VDC AL	28480	0180-3600
A1C32	0180-3587	6	3	CAPACITOR-FXD 1000UF+-20% 50VDC AL	28480	0180-3587
A1C33	0180-3587	6		CAPACITOR-FXD 1000UF+-20% 50VDC AL	28480	0180-3587
A1C34	0180-3587	6		CAPACITOR-FXD 1000UF+-20% 50VDC AL	28480	0180-3587
A1C35	0180-1075	3	3	CAPACITOR-FXD 2200 UF 16VDC AL	28480	0180-1075
A1C36	0160-4808	4	1	CAPACITOR-FXD 470PF +-5% 100VDC CER	28480	0160-4808
A1C37	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
A1C38	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
A1C39	0180-1075	3		CAPACITOR-FXD 2200 UF 16VDC AL	28480	0180-1075
A1C40	0180-1075	3		CAPACITOR-FXD 2200 UF 16VDC AL	28480	0180-1075
A1C41	0180-3664	0	1	CAPACITOR-FXD 3300UF+-20% 10VDC AL	28480	0180-3664
A1C42	0180-3603	7	4	CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1C43	0180-3603	7		CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1C44	0180-3603	7		CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1C45	0180-3603	7		CAPACITOR-FXD 10UF+-20% 100VDC AL	28480	0180-3603
A1CR1	1906-0313	1	1	BRIDGE 600V	28480	1906-0313
A1CR2	1906-0006	9	1	DIODE-FW BRDG 400V 1A	1B546	VE48
A1CR3	1902-0969	5	1	DIODE-ZNR 30V 5% DO-35 PD=.4W TC=+.095%	28480	1902-0969
A1CR4	1901-0050	3	30	DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR5	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150

Table 4-6. A1 Power Supply Replaceable Parts List (2/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1CR6	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR7	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR8	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR9	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR10	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR11	1902-3150	2	2	DIODE-ZNR 9.09V 2% DO-35 PD=.4W	28480	1902-3150
A1CR12	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR13	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR14	1902-0943	5	2	DIODE-ZNR 2.4V 5% DO-35 PD=.4W TC=-.037%	28480	1902-0943
A1CR15	1902-0943	5		DIODE-ZNR 2.4V 5% DO-35 PD=.4W TC=-.037%	28480	1902-0943
A1CR16	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR17	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR18	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR19	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR20	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR21	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR22	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR23	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR24	1902-3150	2		DIODE-ZNR 9.09V 2% DO-35 PD=.4W	28480	1902-3150
A1CR25	1902-0953	7	1	DIODE-ZNR 6.2V 5% DO-35 PD=.4W TC=+.053%	28480	1902-0953
A1CR26	1906-0317	5	2	DIODE-CT-RECT 200V 5A	28480	1906-0317
A1CR27	1906-0316	4	3	DIODE-CT-RECT 200V 5A	28480	1906-0316
A1CR28	1906-0317	5		DIODE-CT-RECT 200V 5A	28480	1906-0317
A1CR29	1906-0316	4		DIODE-CT-RECT 200V 5A	28480	1906-0316
A1CR30	1906-0316	4		DIODE-CT-RECT 200V 5A	28480	1906-0316
A1CR31	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR32	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR33	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR34	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR35	1901-0731	7	5	DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR36	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR37	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR38	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR39	1906-0314	2	1	DIODE-CT-S-BARR 40V 15A	28480	1906-0314
A1CR40	1902-0964	0	2	DIODE-ZNR 18V 5% DO-35 PD=.4W TC=+.09%	28480	1902-0964
A1CR41	1902-3188	6	2	DIODE-ZNR 12.7V 2% DO-35 PD=.4W	28480	1902-3188
A1CR42	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR43	1902-0957	1	1	DIODE-ZNR 9.1V 5% DO-35 PD=.4W TC=+.069%	28480	1902-0957
A1CR44	1902-0951	5	1	DIODE-ZNR 5.1V 5% DO-35 PD=.4W TC=+.035%	28480	1902-0951
A1CR45	1902-3188	6		DIODE-ZNR 12.7V 2% DO-35 PD=.4W	28480	1902-3188
A1CR46	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR47	1902-0964	0		DIODE-ZNR 18V 5% DO-35 PD=.4W TC=+.09%	28480	1902-0964
A1CR48	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR49	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR50	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR51	1901-0731	7		DIODE-PWR RECT 400V 1A	14433	1N4004G
A1CR52	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR53	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR54	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1CR55	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	9N171	1N4150
A1DS1	1990-0486	6	2	LED-LAMP LUM-INT=2MCD IF=25MA-MAX BVR=5V	28480	HLMP-1301
A1DS2	1990-0486	6		LED-LAMP LUM-INT=2MCD IF=25MA-MAX BVR=5V	28480	HLMP-1301
A1E1	0837-0337	1	1	THERMISTOR-SURGE PTCTR BKDN V: DC 230V	28480	0837-0337

Table 4-6. A1 Power Supply Replaceable Parts List (3/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1F1	2110-0014	3	1	FUSE 4A 250V TD 1.25X.25 UL	75915	313004
A1F2	2110-0746	8	2	FUSE 4A 125V NTD UL	28480	2110-0746
A1F3	2110-0746	8		FUSE 4A 125V NTD UL	28480	2110-0746
A1F4	2110-0743	5	5	FUSE 2A 125V UL	28480	2110-0741
A1F5	2110-0743	5		FUSE 2A 125V UL	28480	2110-0741
A1F6	2110-0743	5		FUSE 2A 125V UL	28480	2110-0743
A1F7	2110-0743	5		FUSE 2A 125V UL	28480	2110-0743
A1F8	2110-0743	5		FUSE 2A 125V UL	28480	2110-0743
A1FT1	2110-0663	8	1	FUSE-THERMAL 96 DEG C	28480	2110-0663
A1J1	1251-3819	9	1	CONN-UTIL MT-LK 6-CKT 6-CONT	28480	1251-3819
A1K1	0490-1312	8	1	RELAY IC 5VDC-COIL 10A 240VAC	28480	0490-1312
A1L2	9100-3139	5	2	INDUCTOR 75UH 15% .5D-INX.875LG-IN	28480	9100-3139
A1L3	9100-3139	5		INDUCTOR 75UH 15% .5D-INX.875LG-IN	28480	9100-3139
A1L4	9140-1136	2	1	INDUCTOR 27MH 35% .61W-INX.728LG-IN	28480	9140-1136
A1L5	9140-1135	1	1	INDUCTOR 76UH 15% 1.213W-INX1.161LG-IN	28480	9140-1135
A1Q1	1854-0810	2	12	TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q2	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q3	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q4	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q5	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q6	1853-0459	3	4	TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1Q7	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q8	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q9	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q10	1853-0459	3		TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1Q11	1855-0658	8	2	TRANSISTOR MOSFET N-CHAN E-MODE SI	S0562	2SK386
A1Q12	1855-0658	8		TRANSISTOR MOSFET N-CHAN E-MODE SI	S0562	2SK386
A1Q13	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q14	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q15	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q16	1853-0459	3		TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1Q17	1854-0810	2		TRANSISTOR NPN SI PD=625MW FT=200MHZ	28480	1854-0810
A1Q18	1853-0459	3		TRANSISTOR PNP SI PD=625MW FT=200MHZ	28480	1853-0459
A1R1	0811-3621	8	1	RESISTOR 8 5% 6W PW TC=0+-50	28480	0811-3621
A1R2	0764-0031	7	4	RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R3	0764-0031	7		RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R4	0698-0085	0	4	RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R5	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R6	0764-0031	7		RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R7	0764-0031	7		RESISTOR 47K 5% 2W MO TC=0+-200	28480	0764-0031
A1R8	0757-1094	9	1	RESISTOR 1.47K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1471-F
A1R9	0698-3160	8	1	RESISTOR 31.6K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3162-F
A1R10	0698-3455	4	1	RESISTOR 261K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2613-F
A1R11	0757-0280	3	8	RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R12	0757-0442	9	6	RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R13	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R14	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R15	0698-3457	6	2	RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A1R16	0698-3457	6		RESISTOR 316K 1% .125W F TC=0+-100	28480	0698-3457
A1R17	0811-1668	9	1	RESISTOR 1.5 5% 2W PW TC=0+-400	75042	BWH2-1R5-J
A1R18	0757-0403	2	1	RESISTOR 121 1% .125W F TC=0+-100	24546	CT4-1/8-T0-121R-F
A1R19	2100-3207	1	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A1R20	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F

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Table 4-6. A1 Power Supply Replaceable Parts List (4/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1R21	0698-0084	9	8	RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R22	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R23	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R24	0698-3155	1	6	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R25	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R26	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R27	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R28	0757-0394	0	1	RESISTOR 51.1 1% .125W F TC=0+-100	24546	CT4-1/8-T0-51R1-F
A1R29	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R30	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R31	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R32	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R33	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R34	0698-4037	0	3	RESISTOR 46.4 1% .125W F TC=0+-100	28480	0698-4037
A1R35	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	28480	0698-4037
A1R36	0698-3260	9	3	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A1R37	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A1R38	0698-3635	2	1	RESISTOR 680 5% 2W MO TC=0+-200	28480	0698-3635
A1R39	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R40	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A1R41	0757-0397	3	1	RESISTOR 68.1 1% .125W F TC=0+-100	24546	CT4-1/8-T0-68R1-F
A1R42	0698-3454	3	1	RESISTOR 215K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2153-F
A1R43	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R44	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R45	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R46	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R47	0698-3260	9		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A1R48	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A1R49	0698-0082	7	5	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R50	0757-0401	0	3	RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-TO-101-F
A1R51	0757-0419	0	1	RESISTOR 681 1% .125W F TC=0+-100	24546	CT4-1/8-T0-681R-F
A1R52	2100-3350	5	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 1-TRN	28480	2100-3350
A1R53	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	CT4-1/8-TO-147R-F
A1R54	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R55	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A1R56	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R57	0698-0084	9		RESISTOR 2.15K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2151-F
A1R58	0698-3628	3	2	RESISTOR 220 5% 2W MO TC=0+-200	28480	0698-3628
A1R59	0698-3628	3		RESISTOR 220 5% 2W MO TC=0+-200	28480	0698-3628
A1R63	0698-3435	0	1	RESISTOR 38.3 1% .125W F TC=0+-100	28480	0698-3435
A1R64	0757-0274	5	2	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1211-F
A1R65	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-1211-F
A1R66	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R67	0757-0438	3	1	RESISTOR 5.11K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-5111-F
A1R68	0757-0346	2	2	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A1R69	0757-0984	4	1	RESISTOR 10 1% .5W F TC=0+-100	28480	0757-0984
A1R70	0757-0279	0	2	RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A1R71	0757-0279	0		RESISTOR 3.16K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-3161-F
A1R72	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R73	0698-0085	0		RESISTOR 2.61K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-2611-F
A1R74	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R75	0757-0346	2		RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
A1R76	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-TO-101-F
A1R77	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	CT4-1/8-TO-101-F

Table 4-6. A1 Power Supply Replaceable Parts List (5/5)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A1R78	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R79	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A1R80	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1001-F
A1R81	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1002-F
A1R82	0698-4037	0		RESISTOR 46.4 1% .125W F TC=0+-100	28480	0698-4037
A1R83	0698-3162	0	2	RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A1R84	0698-3162	0		RESISTOR 46.4K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4642-F
A1RV1	1901-1217	6	2	DIODE-VRTS 150V	28480	1901-1217
A1RV2	1901-1217	6		DIODE-VRTS 150V	28480	1901-1217
A1T1	9100-4618	7	1	XFMR-POWER	28480	9100-4618
A1T2	9100-4499	2	1	TRANSFORMER L(PINS 10 & 11): 5.3 MH+-30%	28480	9100-4499
A1T3	9100-4764	4	1	TRANSFORMER	28480	9100-4764
A1T4	9100-4765	5	1	TRANSFORMER	28480	9100-4765
A1TP1	0360-1653	5	18	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP2	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP3	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP4	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP5	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP6	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP7	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP8	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP9	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP10	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP11	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP12	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP13	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP14	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP15	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP16	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP17	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1TP18	0360-1653	5		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1653
A1U1	1826-0147	9	1	IC 7812 V RGLTR TO-220	04713	MC7812CP
A1U2	1826-1599	7	1	IC V RGLTR-SWG 16-DIP-P PKG	28480	1826-1599
A1U3	1826-0122	0	1	IC 7805 V RGLTR TO-220	07263	7805UC
A1U4	1990-1190	1	3	DOUBLE-COUPLER	28480	1990-1190
A1U5	1990-1190	1		DOUBLE-COUPLER	28480	1990-1190
A1U6	1990-1190	1		DOUBLE-COUPLER	28480	1990-1190
A1W1	1251-4822	6	1	CONN-POST TYPE .100-PIN-SPCG 3-CONT	28480	1251-4822
A1X1	1252-1598	9	2	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
A1X2	1252-1598	9		CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	0340-1126	5	1	BARRIER-BLOCK 18-TERM INTERNAL FEED THRU	28480	0340-1126
	04278-00601	5	1	BOX SHIELD	28480	04278-00601
	04278-00602	6	1	BOX SHIELD	28480	04278-00602
	04278-01204	6	1	HEAT SINK	28480	04278-01204
	0515-1007	2	4	SCREW-MACH M3 X 0.5 16MM-LG	28480	0515-1007
	0515-1550	0	7	SCREW-MACHINE ASSEMBLY M3 X 0.5 8MM-LG	28480	0515-1550
	0515-1551	1	4	SCREW-MACHINE ASSEMBLY M3 X 0.5 10MM-LG	28480	0515-1551
	1258-0141	8	1	JUMPER-REMOVABLE FOR 0.025 IN SQ PINS	28480	1258-0141
	2110-0269	0	2	FUSEHOLDER-CLIP TYPE.25D-FUSE	28480	2110-0269
	4040-0748	3	1	EXTR-PC BD BLK POLYC .062-IN-BD-THKNS	28480	4040-0748
	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-IN-BD-THKNS	28480	4040-0749

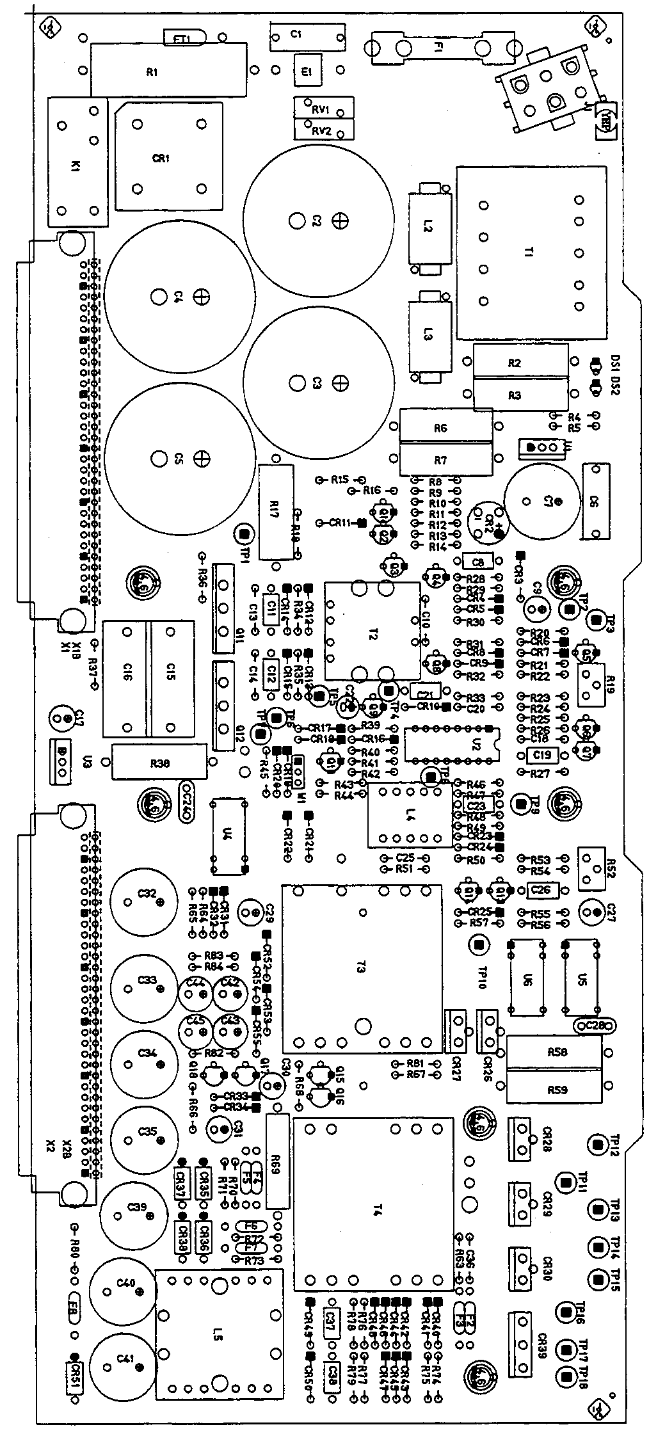


Figure 4-3. A1 Power Supply Component Locations

A1 POWER SUPPLY

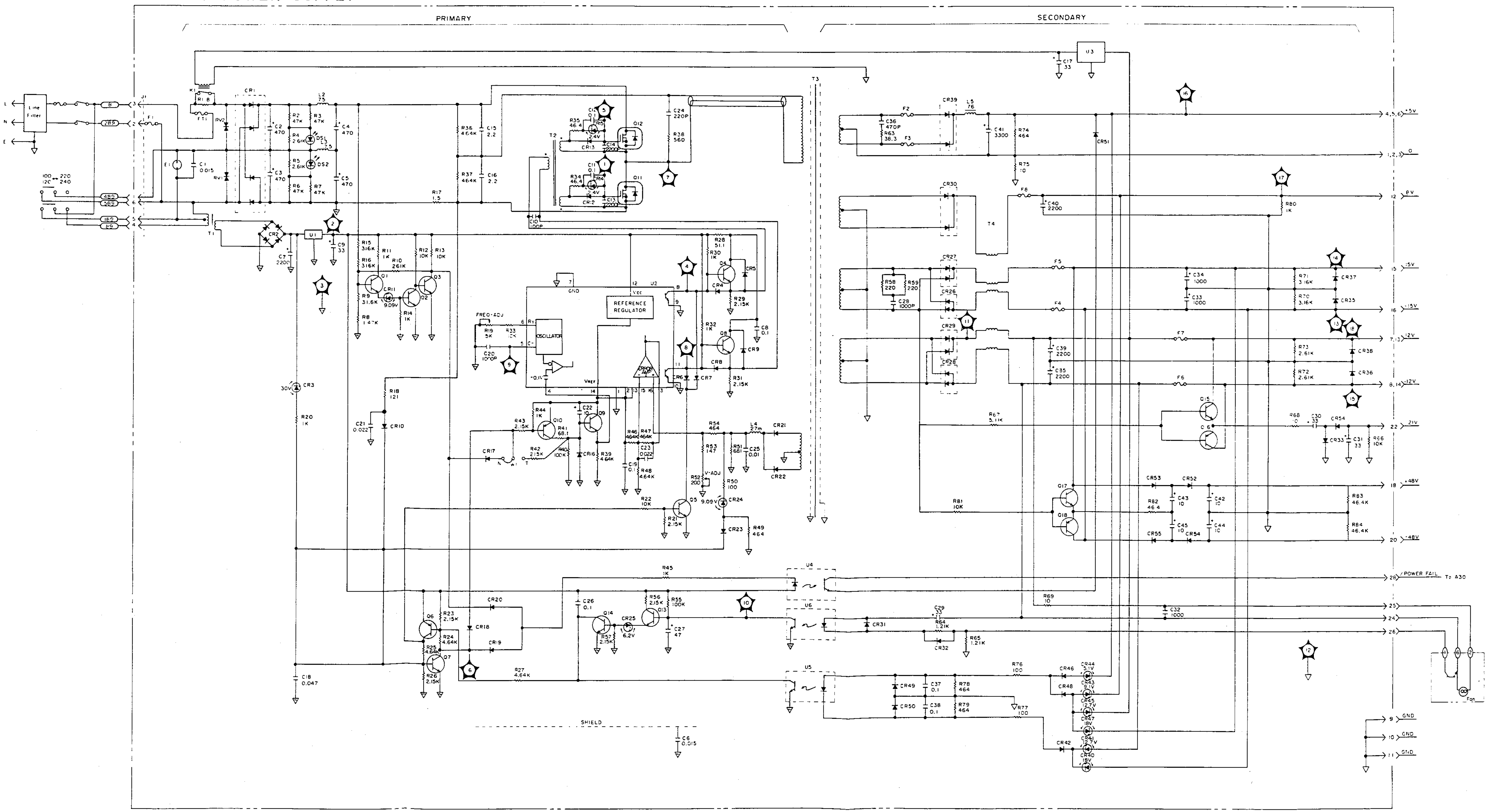


Figure 4-4. A1 Power Supply Schematic Diagrams

4-9. A2 MODULATOR SERVICE SHEET

The A2 modulator board is covered by the exchange assembly program. The part number of the A2 rebuilt exchange board is listed in
Table 4-A2-1. A2 Modulator Replaceable Parts List.

Table 4-A2-1. A2 Modulator Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A2						
A2	04284-66502	1	1	MODULATOR	28480	04284-66502
	04284-69502			MODULATOR (RE-BUILT)	28480	04284-69502

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These troubleshooting aids provide a list of jumpers and test points. The jumpers are listed in Table 4-A2-2, and the test points are listed in Table 4-A2-3. The test point locations are shown in Figure 4-A2-1.

Table 4-A2-2. Jumper List

Reference Designator	Description	Use
A2J4	0° Integrator Output Selection	**Normal Position:** Connects the 0° integrator output signal to the modulator. **Test Position:** Connects -8 V DC to the modulator.
A2J5	90° Integrator Output Selection	**Normal Position:** Connects the 90° integrator output signal to the modulator. **Test Position:** Connects -8 V DC to the modulator.
A2J201 A2J202 A2J203 A2J301 A2J302 A2J303	Zero Offset Adjustments Jumpers	These jumpers are used for Adjustments. (Refer to SECTION 2.)

Table 4-A2-3. A2 Test Points

Test Point	Signal Name	Description
A2TP1	*GND*	Ground Line
A2TP2	*UNBAL*	UNBALANCE Detector Signal
A2TP3	*X30*	Signal multiplied I-V converter output signal by 30
A2TP4	*GND*	Ground Line
A2TP5	*NULL*	Null Detector Signal
A2TP6	*-8*	-8 V DC
A2TP7	*+8*	+8 V DC
A2TP8	*0DEG*	0° reference signal
A2TP9	*90DEG*	90° reference signal
A2TP10	*-12*	-12 V DC
A2TP11	*GND*	Ground Line
A2TP12	*MOD*	Modulator Output Signal
A2TP13	*GND*	Ground Line
A2TP14	*NULLOUT*	Normalized Output Signal from the summing amplifier

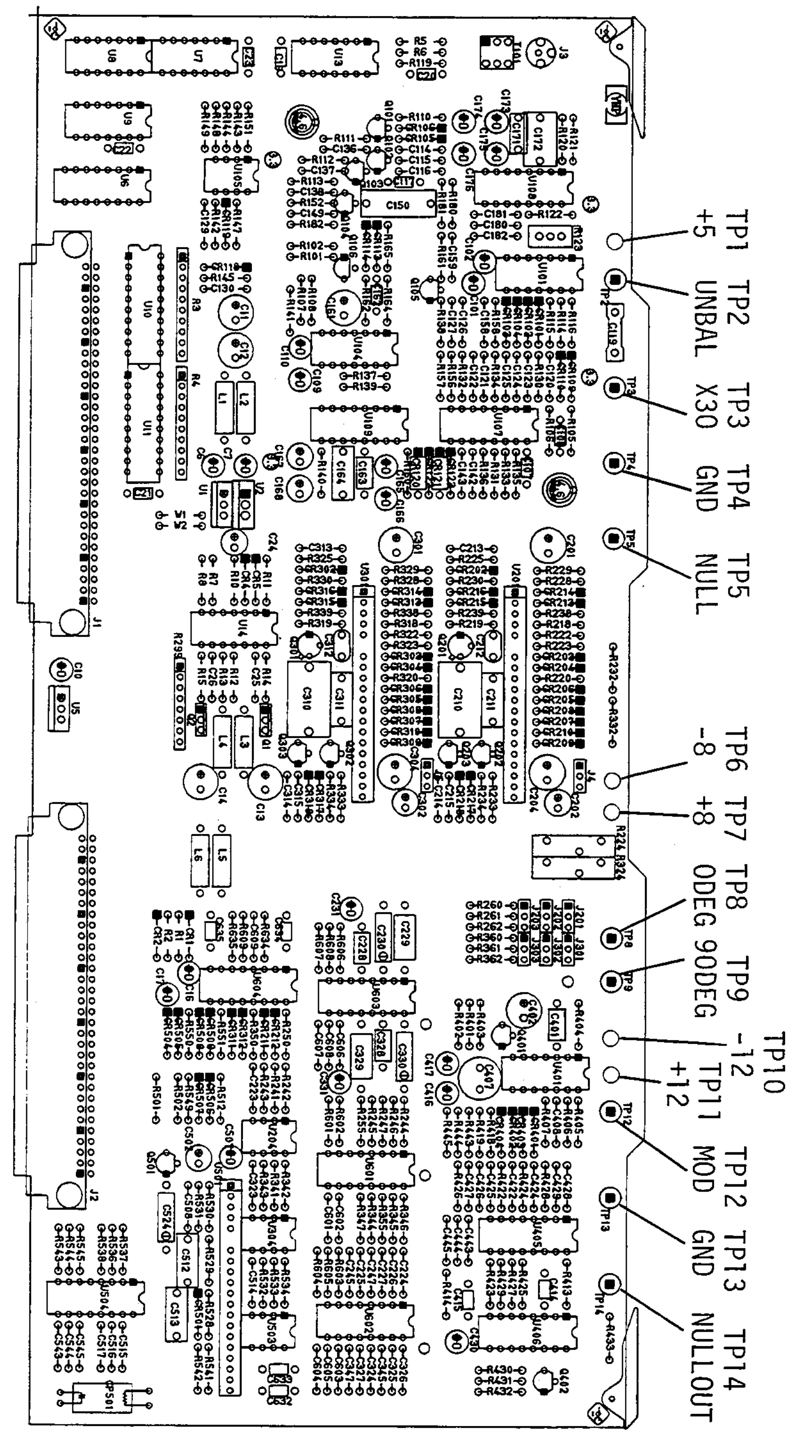


Figure 4-A2-1. A2 Modulator Test Points Locations

NOTES

4-10. A3 RANGE RESISTOR SERVICE SHEET

The A3 board is covered by the exchange assembly program. The part number of the A3 board for a standard HP 4284A is different from the part number of the A3 board for an Option 001 HP 4284A. The part number of the A3 rebuilt exchange board is listed in Table 4-A3-1.

Table 4-A3-1. A3 Range Resistor Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A3						
A3	04284-66503	2	1	RANGE RESISTOR (STANDARD)	28480	04284-66503
	04284-69503			RANGE RESISTOR (STANDARD) (RE-BUILT)	28480	04284-69503
	04284-66563	4	1	RANGE RESISTOR (OPT.001)	28480	04284-66563
	04284-69563			RANGE RESISTOR (OPT.001) (RE-BUILT)	28480	04284-69563

These troubleshooting aids provide a list of test points. The A3 board test point locations for the standard 4284As are shown in Figure 4-A3-1, and the A3 board test point locations for Option 001 4284As are shown in Figure 4-A3-2.

Table 4-A3-2. A3 Test Points

Test Point	Signal Name	Description
A3TP1	*IV*	I-V Converter Output
A3TP2	*GND*	Ground Line
A3TP3	*LC*	Lc gain amplifier signal
A3TP4	*ERR*	Voltage Signal proportional to the current trough the DUT
A3TP5	*GND*	Ground Line
A3TP6	*EDUT*	Voltage Signal Across the DUT
A3TP7		+5 V DC
A3TP8		-12 V DC
A3TP9		+12 V DC

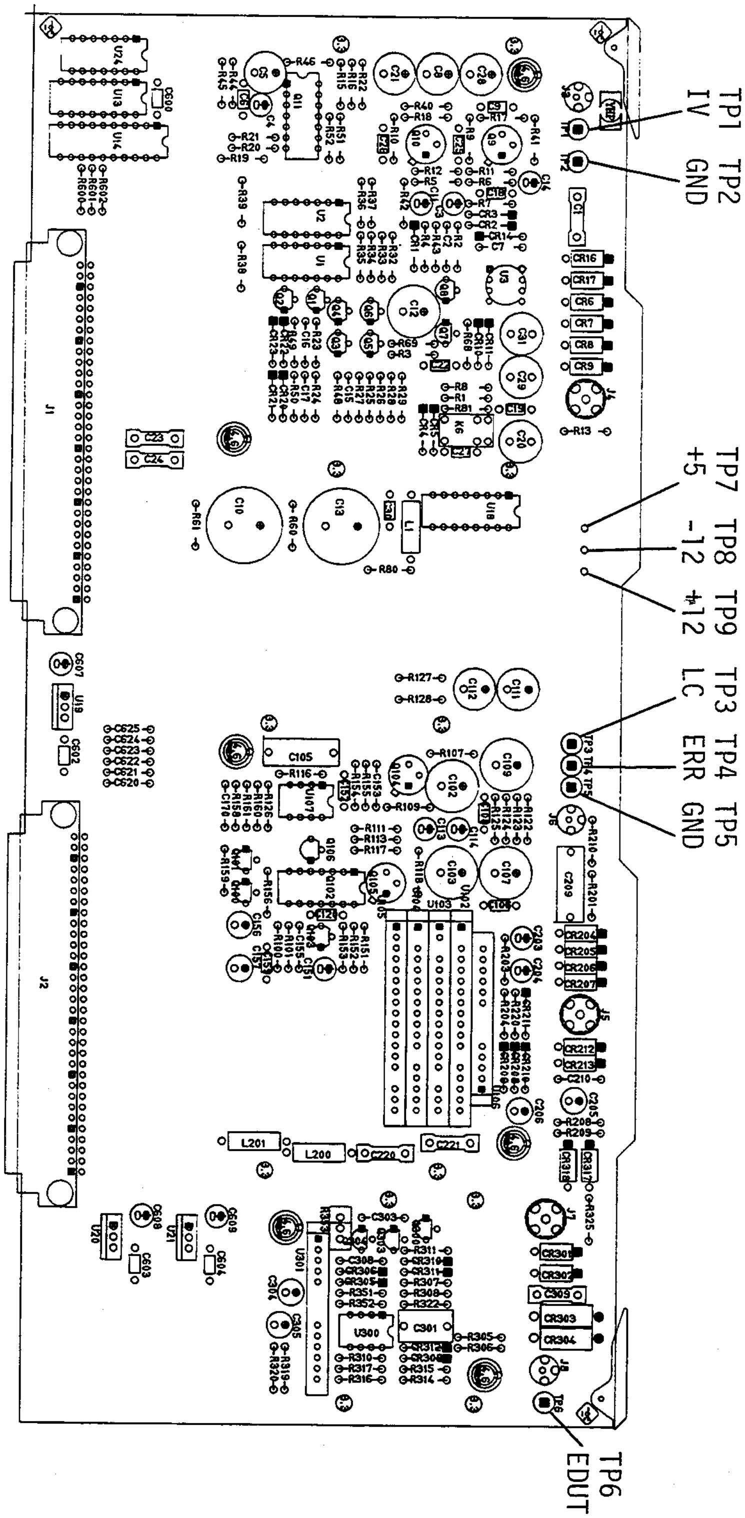


Figure 4-A3-1. A3 Modulator Component Locations (Std)

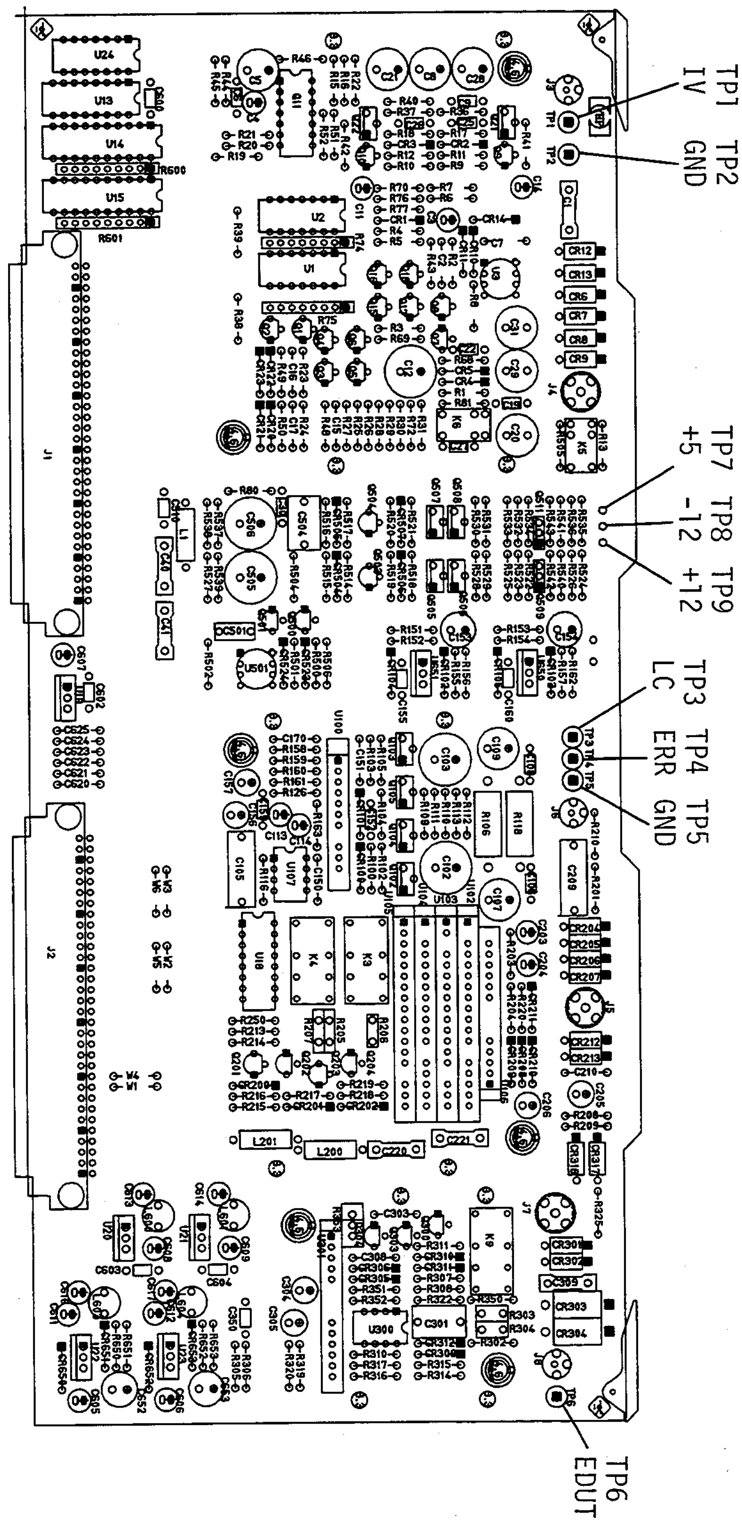


Figure 4-A3-2. A3 Modulator Component Locations (Opt.001)

4-11. A4 HIGH POWER AMPLIFIER/DC BIAS SERVICE SHEET

The A4 board is covered by the exchange assembly program. The part number of an A4 rebuilt exchange board is listed in Table 4-A4-1.

Table 4-A4-1. A4 High Power Amplifier/DC Bias Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A4						
A4	04284-66564	5	1	DC BIAS/HIGH POWER AMP	28480	04284-66564
	04284-69564			DC BIAS/HIGH POWER AMP (RE-BULILT)	28480	04284-69564

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These troubleshooting aids provide a list of test points in Table 4-A4-2. The A4 high power amplifier/DC bias board test point locations are shown in Figure 4-A4-1.

Table 4-A4-2. A4 Test Points List

Test Point	Signal Name	Description
A4TP1	*VIN*	AC Voltage signal from the A5 board
A4TP2	*+8*	+8 V DC
A4TP3	*GND*	Ground Line
A4TP4	*VOUT*	Output signal to Hcur Terminal
A4TP5		Output signal from the high voltage amplifier
A4TP6	*OVLD*	AC signal overload signal
A4TP7	*GND*	Ground Line
A4TP8	*+50*	+50 V DC
A4TP9	*-50*	-50 V DC
A4TP10	*+5V*	+5 V DC
A4TP11	*-8V*	-8 V DC
A4TP12	*HF*	Buffer output signal (Hi-PW mode: ON)
A4TP13	*DAC*	Output signal from DAC
A4TP14	*VREF*	+/- 5 V (the sign depends on the polarity of the DC bias setting)
A4TP15		AC output signal from preamplifier
A4TP16	*VDC*	DC voltage signal (Full Scale: 5 V)
A4TP17	*GND*	Ground Line

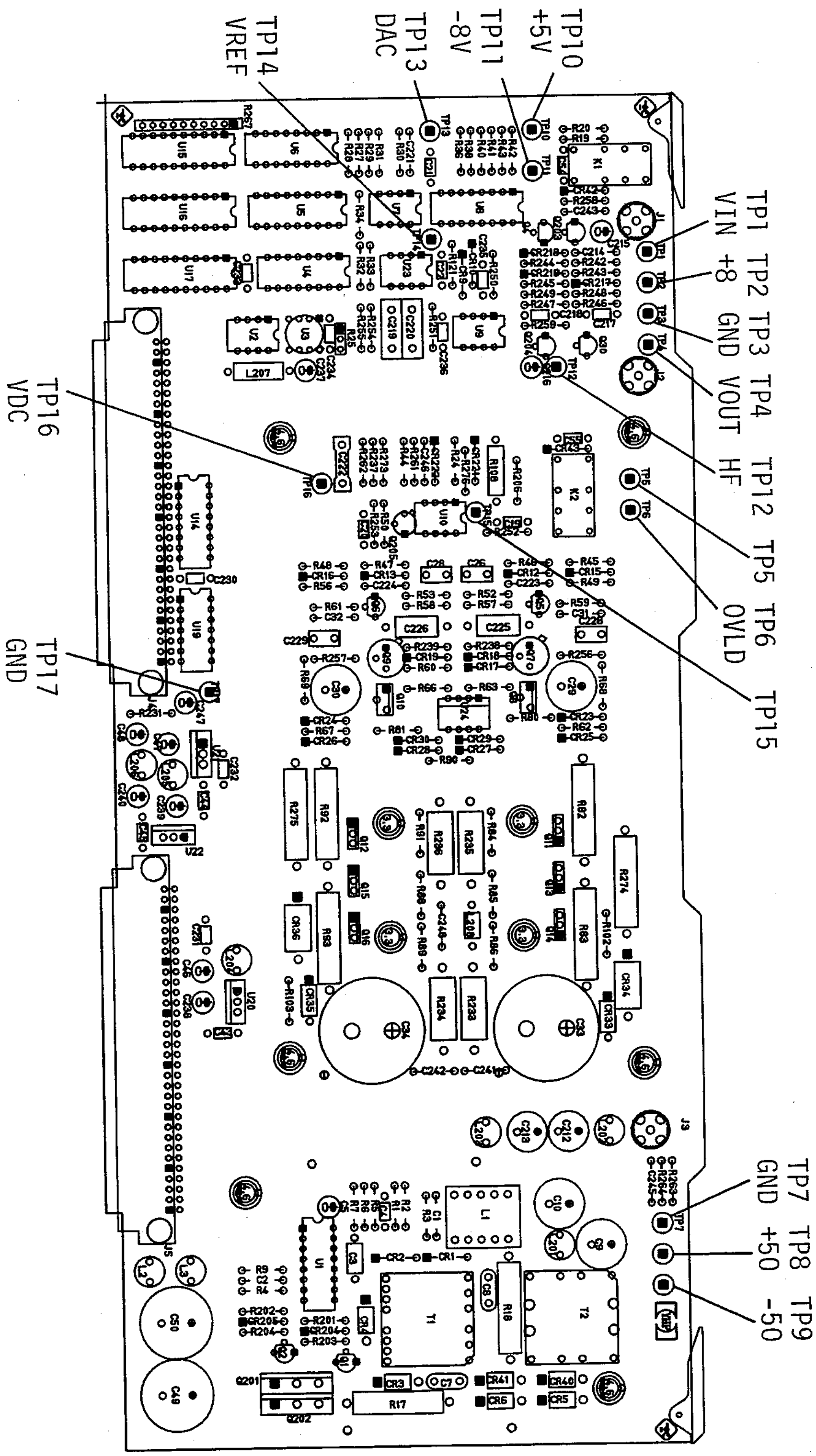


Figure 4-A4-1. A4 High Power Amplifier/DC Bias Test Points Locations

NOTES

4-12. A5 SIGNAL SOURCE SERVICE SHEET

The A5 signal source board is covered by the exchange assembly program. The part number of an A5 rebuilt exchange board is listed in Table 4-A5-1.

Table 4-A5-1. A5 Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A5						
A5	04284-66505	4	1	SIGNAL SOURCE	28480	04284-66505
	04284-69505			SIGNAL SOURCE (RE-BUILT)	28480	04284-69505

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These troubleshooting aids provide a list of test points in Table 4-A5-2. The test point locations are shown in Figure 4-A5-1.

Table 4-A5-2. A5 Test Points List

Test Point	Signal Name	Description
A5TP1	*DIVIN*	Crystal oscillator signal
A5TP2	*DIVOUT*	Signal divided the *DIVIN* signal by N
A5TP3	*QUAST*	0° quasi-sine wave signal
A5TP4	*90IN*	90° quasi-sine wave signal
A5TP5	*90OUT*	90° reference signal (20 Hz to 5 kHz)
A5TP6	*0DEG*	0° reference phase signal
A5TP7	*ATTDAC*	Output signal from the DAC
A5TP8	*ATT*	Output signal from the attenuator
A5TP9	*OUT*	Output signal to Hcur Terminal
A5TP10	*+9*	+9 V DC
A5TP11	*+5A*	+5 V DC (A)
A5TP12	*-9*	-9 V DC
A5TP13	*5B*	+5 V DC (B)
A5TP14	*GND*	Ground Line

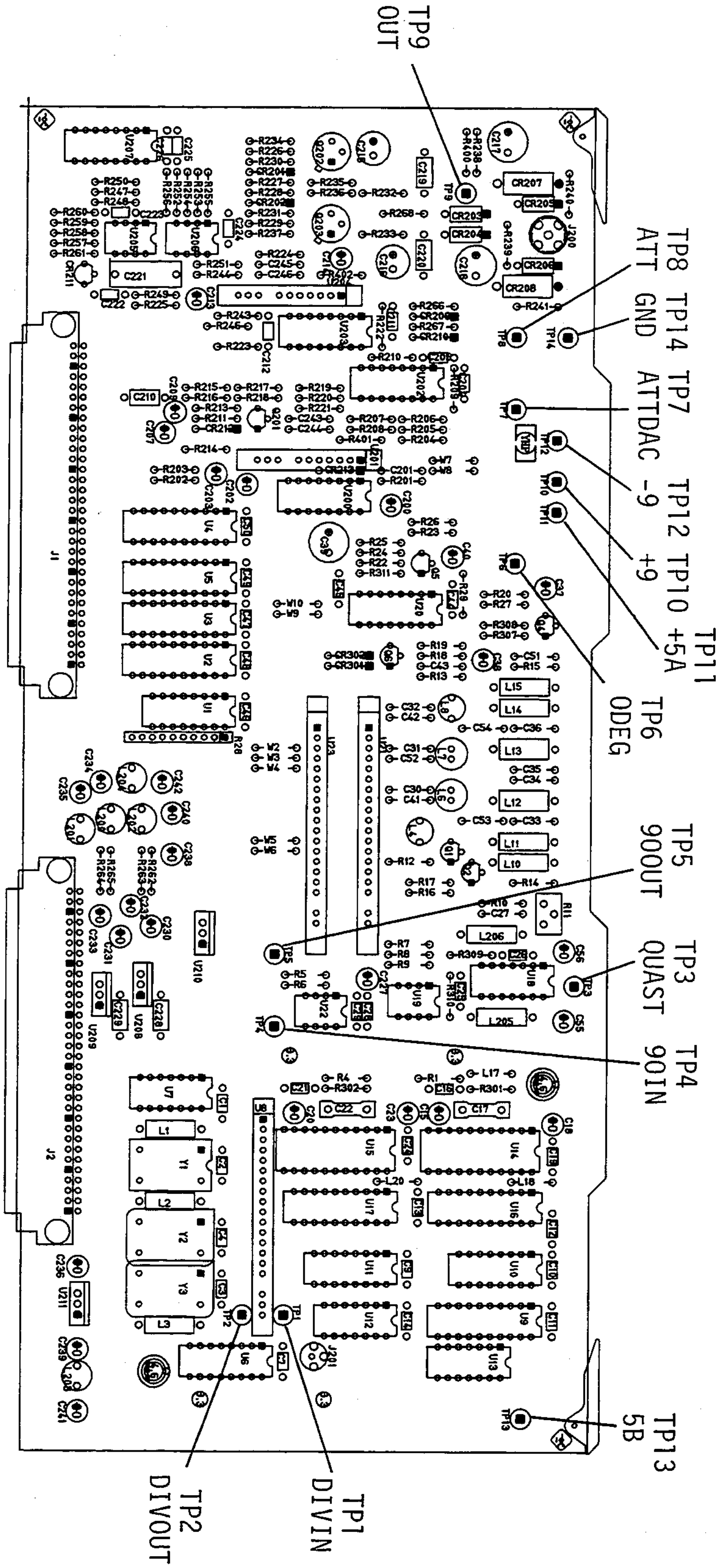


Figure 4-A5-1. A5 Signal Source Test Points Locations

NOTES

4-13. A6 VECTOR RATIO DETECTOR SERVICE SHEET

The A6 vector ratio detector board is covered by the exchange assembly program. The part number of an A6 rebuilt exchange board is listed in Table 4-A6-1.

Table 4-A6-1. 6 Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A6						
A6	04284-66506	5	1	VECTOR RATIO DETECTOR	28480	04284-66506
	04284-69506			VECTOR RATIO DETECTOR (RE-BUILT)	28480	04284-69506

These troubleshooting aids provide a list of jumpers and test points. The jumpers are listed in Table 4-A6-2, and the test points are listed in Table 4-A6-3. The test point locations are shown in Figure 4-A6-1.

Table 4-A6-2. A6 Jumper List

Reference Designator	Description	Use
A6J3	Phase Sensitive Detector Input Selection	**Normal Position:** Connects either EDUT or ERR signals to the phase sensitive detector. **Test Position:** Connects GND to the input of the phase sensitive detector.
A6J4	A-D Converter Input Selection	**Normal Position:** Connects the phase detected signal to the A-D converter. **Test Position:** Connects the GND to the input of the A-D converter.

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Table 4-A6-3. A6 Test Points List

Test Point	Signal Name	Description
A6TP1	*VIN*	Crystal oscillator signal
A6TP2	*GND*	Ground Line
A6TP3	*IT*	Integration time signal
A6TP4	*EOC*	End of measurement signal
A6TP5	*PD*	Input signal to the phase detector
A6TP6	*AD*	Input signal to the A-D converter
A6TP7	*GND*	Ground Line
A6TP8	*INTEG*	A-D Converter output signal
A6TP9	*-12*	-12 V DC
A6TP10	*+12*	+12 V DC
A6TP11	*+5*	+5 V DC
A6TP12	*MEAS*	Measurement Start Signal

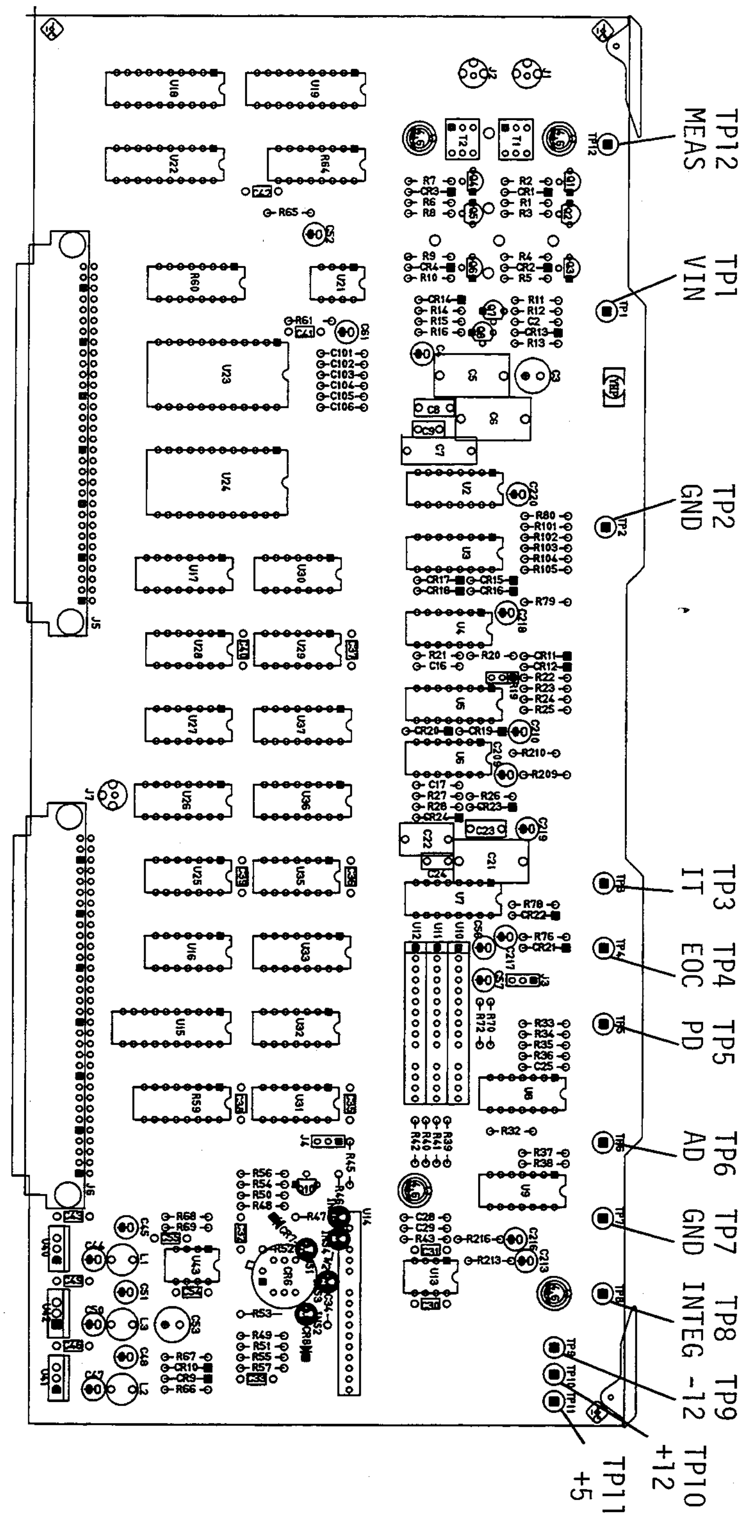


Figure 4-A6-1. A6 Vector Ratio Detector Test Point Locations

NOTES

4-14. A7 DIGITAL CONTROL SERVICE SHEET

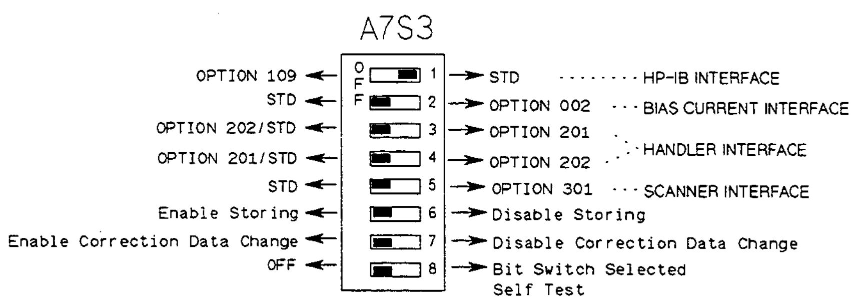
4-14-1. CIRCUIT DESCRIPTION

The A7's (Digital Control board) MPU is A7U3 (16-bit micro processor). A7U6, A7U7, A7U8, A7U18, A7U19 and A7U20 are the programmed ROMs. If a ROM or ROMs fail the check sum test during the power-on self test, the message "**ROM CHECK SUM ERROR NO=xx**" will be displayed. The ROM numbers and corresponding messages are listed in Table 4-A7-1.

Table 4-A7-1. ROM Number

ROM Number	Reference Designator
0	A7U6
1	A7U18
2	A7U7
3	A7U19
4	A7U8
5	A7U20

The A7 board determines which Options (digital interface) are installed in the HP 4284A by reading the A7S3 bit switch setting. The bit switch settings are as follows.



(Standard Position)

Bit No.	Description	OFF	ON
1	HP-IB	Not installed	Installed
2	Bias Current I/F	Not installed	Installed
3	Handler I/F	Opt.202 installed or not installed	Opt.201 installed
4	Handler I/F	Opt.201 installed or not installed	Opt.202 installed
5	Scanner I/F	Not installed	Installed
6*	Storing	Enable storing	Disable storing
7*	Correction data change	Enable changing	Disable changing
8	Self test	Normal position	Self test position (refer to SECTION 3)

*: The description for the bit 6 and 7 is discussed in Appendix G of the HP 4284A Operation Manual.

4-14-2. TROUBLESHOOTING AIDS

Since the A7 board has been set up under the exchange program, when the A7 board is defective, you replace the A7 board. The board isolation procedure is given in SECTION 3.

4-14-3. REPLACEABLE PARTS LIST

The replaceable parts for the A7 board are divided into two groups: a ROMless A7 board and a set of programmed ROMs. This protects against the mismatching of ROM versions between the replaced CPU board and the defective CPU board. Only the ROMless A7 board has been set up under the exchange assembly program. If the A7 board is defective without ROMs installed and the ROMs are not defective, order a ROMless A7 board. (Install the ROMs from the defective A7 board on the replacement A7 board.) If both the A7 board and the ROMs are defective, order a ROMless A7 board and the four ROMs.

The replaceable parts for the A7 board are listed in Table 4-A7-2. The part number for a rebuilt exchange board is listed on the first page of the A7 board's replaceable parts list.

4-14-4. COMPONENT LOCATIONS

The component locations for the A7 Digital Control Board are shown in Figure 4-A7-1.

4-14-5. SCHEMATIC DIAGRAMS

The A7 Digital control Board's schematic diagram is not supplied since of the ROMless A7 board has been set up on the exchange assembly program.

Table 4-A7-2. A7 Digital Control Replaceable Parts Lists

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A7						
A7	04284-66657	7	1	DIGITAL CONTROL W/O ROM	28480	
	04284-69657			DIGITAL CONTROL W/O ROM (RE-BUILT)	28480	
				ROM		
				Version 1.10		
	04284-86301	0		ROMs (version 1.10) Set	28480	04284-86301
A7U6	04284-85301	8	1	ROM 0K BIT0	28480	04284-85301
A7U7	04284-85303	0	1	ROM 20K BIT0	28480	04284-85303
A7U8	04284-85305	2	1	ROM 40K BIT0	28480	04284-85305
A7U18	04284-85302	1	1	ROM 0K BIT8	28480	04284-85302
A7U19	04284-85304	1	1	ROM 20K BIT8	28480	04284-85304
A7U20	04284-85306	3	1	ROM 40K BIT8	28480	04284-85306

4:Service Sheets

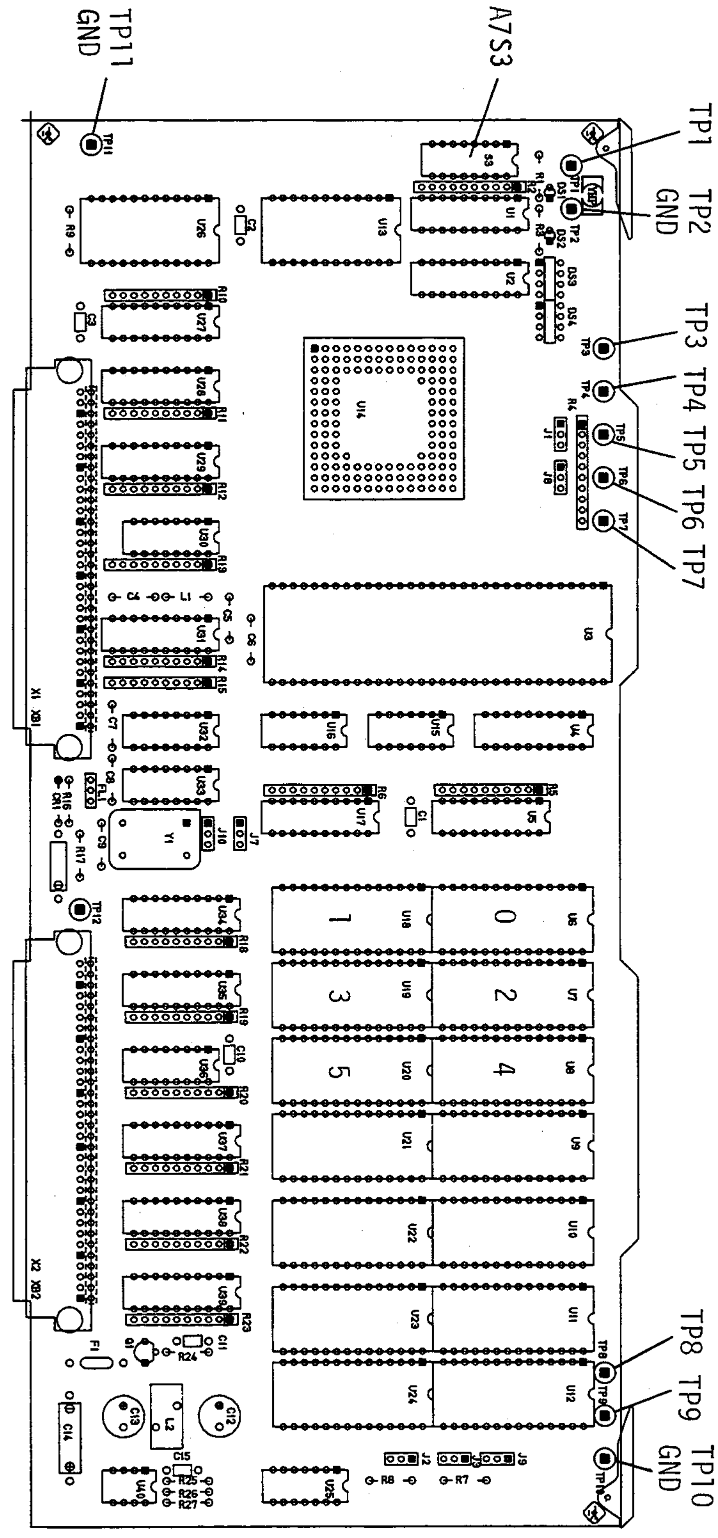


Figure 4-A7-1. A7 Digital Control Component Locations

4-15. A9, A13, A90, AND A91 BOARDS SERVICE SHEET

4-15-1. CIRCUIT DESCRIPTION

The A9 keyboard consists of Key switches, LED indicators, a buzzer, and the LCD contrast potentiometer. The A13 DC-AC Converter Board converts ±12 V DC into 600 V AC to supply the 600 V AC to the A91 LCD Module board to backlight the LCD. The A90 Keyboard/ Display Control Module board interfaces the A7 CPU board to both the A9 Keyboard and the A91 LCD module board. The A91 LCD module is the HP 4284A's display screen.

4-15-2. TROUBLESHOOTING AIDS

Fuse A9F1 for the A90 board and is located on the A9 Keyboard. If the HP 4284A display screen isn't active, check fuse A9F1 first.

The A90 and A91 board assemblies aren't repaired at the component level because the components on each board are surface mounted, and they are difficult to be replace. Thus, A90 or A91 are faulty, repair them at the assembly level only.

4-15-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A9 Keyboard are listed in Table 4-A9/A13/A90/A91-1. The replaceable parts for the A13 DC-AC Converter are listed in Table 4-A9/A13/A90/A91-2. The replaceable parts for the A90 Keyboard/Display Control and the A91 LCD module are listed in Table 4-A9/A13/A90/A91-3. The A90 and A91 boards are repaired at the assembly level only, because the components on each board are surface mounted, and are difficult to replace. So, only the complete assembly part numbers are listed in Table 4-A9/A13/A90/ A91-3.

4-15-4. COMPONENT LOCATIONS

The component locations for the A9 Keyboard and the A13 DC-AC Converter board are shown in Figure 4-A9/A13/A90/A91-1. Component locations for the A90 and A91 boards are not shown because these boards are repaired at the assembly level only.

4-15-5. SCHEMATIC DIAGRAMS

The A9 Keyboard, A13 DC-AC Converter, A90 Keyboard/Display Control Unit, and A91 LCD Module schematic diagrams are shown in Figure 4-A9/A13/A90/A91-2.

Table 4-A9/A13/A90/A91-1. A9 Keyboard Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A9						
A9	04279-66559	1	1	KEY BOARD	28480	04279-66559
A9C1	0180-0197	8	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	56289	150D225X9020A2
A9DS1	1990-0487	7	4	LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS2	1990-0487	7		LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS3	1990-0487	7		LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS4	1990-0487	7		LED-LAMP LUM-INT=2MCD BVR=5V	28480	HLMP-1401
A9DS5	1990-1226	4	1	LED-LAMP LUM-INT=2.2MCD IF=20MA-MAX	28480	1990-1226
A9F1	2110-0741	3	1	FUSE 1A 125V NTD UL	28480	2110-0741
A9J1	1251-4959	0	1	CONNECTOR 2-PIN M METRIC POST TYPE	28480	1251-4959
A9R1	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A9R2	0757-0465	6	1	RESISTOR 100K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-1003-F
A9R3	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
A9R4	0698-0082	7	4	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R5	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R6	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R7	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
A9R8	2100-4174	3	1	RESISTOR-VAR CONTROL CF 20K 10% LIN	28480	2100-4174
A9R9	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	CT4-1/8-T0-196R-F
A9SP10	9164-0295	2	1	ALARM-AUDIBLE	28480	9164-0295
A9U1	1820-1423	4	1	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A9W1	8120-4904	5	1	FLEX JUMPER WIRE	28480	8120-4904
A9W2	8120-4910	3	1	FLEX JUMPER WIRE	28480	8120-4910

Table 4-A9/A13/A90/A91-2. A13 DC-AC Converter Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A13						
A13	04278-66513	6	1	DC-AC CONVERTER	28480	04278-66513
A13C1	0180-3602	6	1	CAPACITOR-FXD 22UF+-20% 50VDC AL	28480	0180-3602
A13DS1	2140-0127	2	1	LAMP-NEON 90V	28480	2140-0127
A13E1	04278-61101	8	1	CONVERTER DCIAC	28480	04278-61101
A13J1	1251-4938	5	2	CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
A13J2	1251-4938	5		CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
A13L1	9140-1278	3	1	INDUCTOR 68UH 10% 7.5D-MM Q=60	28480	9140-1278
A13R1	0689-1055	7	2	RESISTOR 1M 5% 1W CC TO=0+1000	01121	GB1055
A13R2	0689-1055	7		RESISTOR 1M 5% 1W CC TO=0+1000	01121	GB1055
A13R3	0698-3454	3	1	RESISTOR 215K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-2153-F
A13R4	0698-3455	4	1	RESISTOR 261K 1% .125W F TC=0+-100	24546	CT4-1/8-TO-2613-F

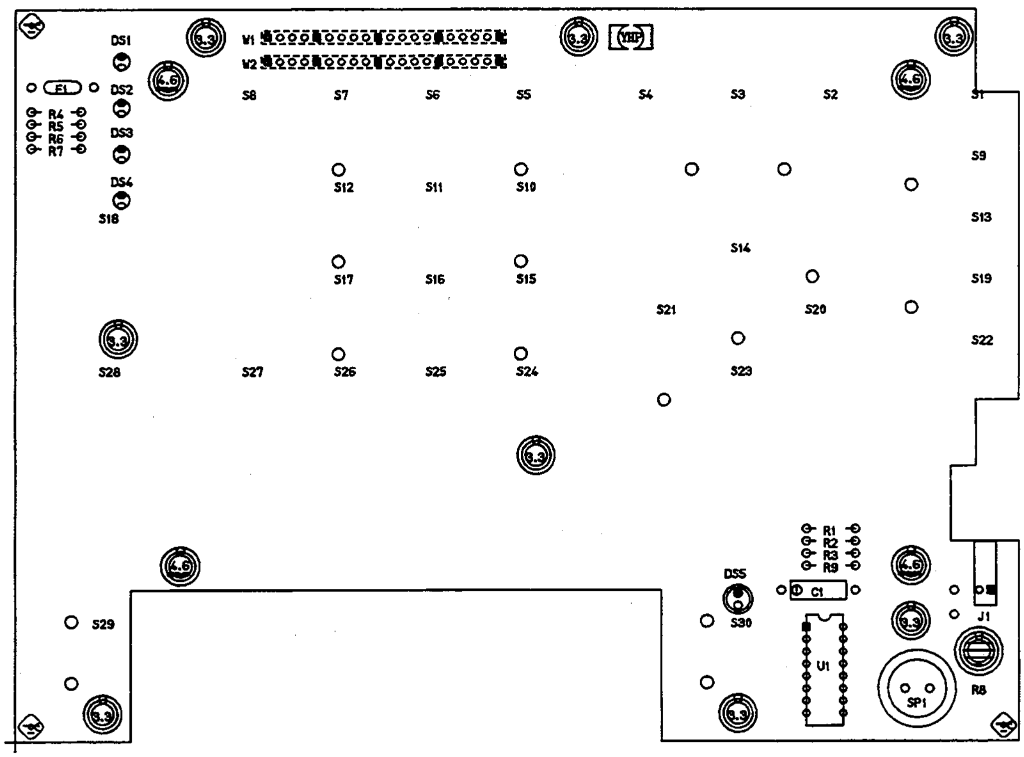
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Table 4-A9/A13/A90/A91-3. A90 and A91 Boards Replaceable Parts List

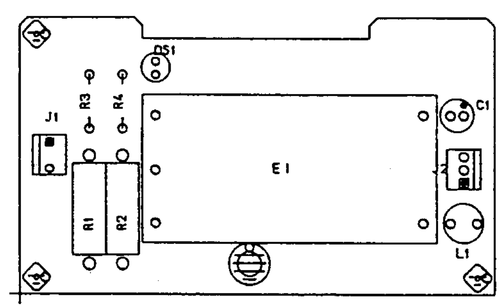
Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A90						
A90	04278-66590	9	1	KEYBOARD/DISPLAY CONTROL	28480	04278-66590
A91						
A91	04278-61102	9	1	LCD MODULE	28480	04278-61102

NOTES

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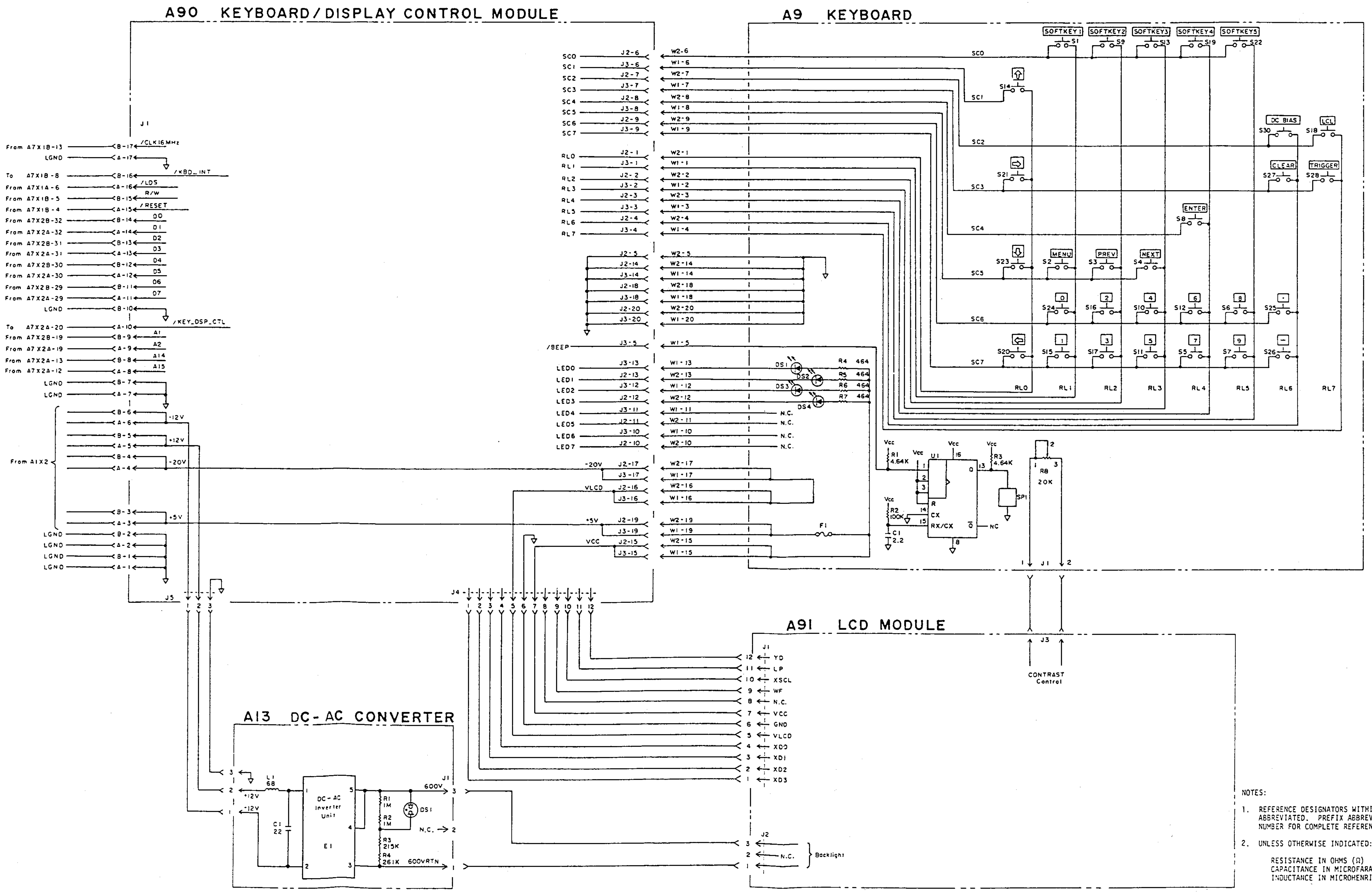


A9 Component Locations



A13 Component Locations

Figure 4-A9/A13/A90/A91-1. A9 Keyboard/A13 DC-AC Converter Component Locations



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.

2. UNLESS OTHERWISE INDICATED:

RESISTANCE IN OHMS (Ω)
CAPACITANCE IN MICROFARADS (μF)
INDUCTANCE IN MICROHENRIES (μH)

Figure 4-A9/A13/A90/A91-2. A9, A13, A90, and A91 Schematic Diagram

4-16. A10 MEMORY CARD INTERFACE SERVICE SHEET

4-16-1. CIRCUIT DESCRIPTION

The A10 Memory card I/F board contains only connectors for the A7 CPU board and the Memory Card.

4-16-2. TROUBLESHOOTING AIDS

No troubleshooting data is given for the A10 Memory Card I/F board. The pin assignment list gives the information needed for troubleshooting.

4-16-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A10 Memory Card I/F board are listed in Table 4-A10-1.

4-16-4. COMPONENT LOCATIONS

The component locations for the A10 Memory Card Board are shown in Figure 4-A10-1.

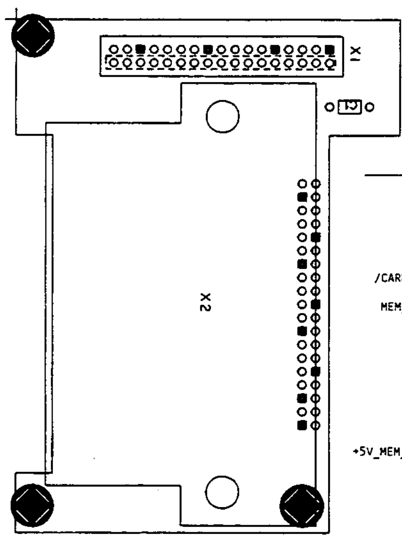
4-16-5. SCHEMATIC DIAGRAMS

A schematic diagram for the A10 Memory Card I/F board is not supplied, the pin assignments give the information needed for troubleshooting.

Table 4-A10-1. A10 Memory Card Replaceable Parts Lists

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A10						
	04278-66510	3	1	MEM CARD SOCKET	28480	04278-66510
C1	0160-6561	0	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
X1	1251-3025	9	1	CONN-POST TYPE .100-PIN-SPCG 34-CONT	28480	1251-3025
X2	1252-1951	3	1	CONN 38PIN	28480	1252-1951

A10X1A	Pin No.	A10X1B
+5V_MEM_CARD	1	nc
CARD_RW	2	nc
nc	3	
A9	4	A10
A12	5	/CARD_LDS
A11	6	/MEM_CARD
D7	7	D6
D5	8	D4
D3	9	GND
nc	10	GND
D2	11	D1
D0	12	A1
A2	13	A3
A4	14	A5
A6	15	A7
A8	16	A13
nc	17	+5V_MEM_CARD



A10X2

	Pin No.		
nc	37	38	+5V_MEM_CARD
A9	35	36	nc
A12	33	34	A10
A11	31	32	nc
nc	29	30	CARD_RW
nc	27	28	nc
/CARD_LDS	25	26	GND
nc	23	24	nc
MEM_CARD	21	22	nc
D6	19	20	D7
D4	17	18	D5
D3	15	16	GND
D1	13	14	D2
A1	11	12	D0
A3	9	10	A2
A5	7	8	A4
A7	5	6	A6
A13	3	4	A8
+5V_MEM_CARD	1	2	nc

Figure 4-A10-1. A10 Memory Card I/F Component Locations

NOTES

4-17. A11 MOTHERBOARD SERVICE SHEET

4-17-1. CIRCUIT DESCRIPTION

The A11 Motherboard is the common bus for all other boards.

4-17-2. TROUBLESHOOTING AIDS

No troubleshooting data is given for the A11 Motherboard. The pin assignments on the A11 circuit side gives the information needed for troubleshooting, see Figure 4-A11-1.

4-17-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A11 Motherboard are listed in Table 4-A11-1.

4-17-4. COMPONENT LOCATIONS

The component locations on the A11 motherboard are shown in Figure 4-A11-2.

4-17-5. SCHEMATIC DIAGRAMS

A schematic diagram for the A11 Motherboard is not supplied, the pin assignments give the information needed for troubleshooting.

Table 4-A11-1. A11 Motherboard Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A11						
A11	04284-66511	2	1	A11 MOTHERBOARD	28480	04284-66511
J1	1251-4938	5	1	CONNECTOR 3-PIN M METRIC POST TYPE	28480	1251-4938
J2	1251-5066	2	1	CONN-POST TYPE 2.5-PIN-SPCG 2-CONT	28480	1251-5066
J3	1251-7406	8	1	CONNECTOR 10-PIN M METRIC POST TYPE	28480	1251-7406
J4	1252-1404	6	2	CONN-POST TYPE 2.54-PIN-SPCG 34-CONT	28480	7834-0000T
J5	1252-1404	6		CONN-POST TYPE 2.54-PIN-SPCG 34-CONT	28480	7834-0000T
X1	1252-1745	8	18	CONN-POST TYPE 64-CONT	28480	1252-1745
X2	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X4	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X5	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X6	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X7	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X8	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X9	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X10	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X11	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X13	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X14	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X15	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X16	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X17	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X18	1252-1745	8		CONN-POST TYPE 64-CONT	28480	1252-1745
X19	1251-4938	5	1	CONNECTOR 3-PIN	28480	1251-4938
X20	1251-5066	2	1	CONN-POST TYPE 2-CONT	28480	1251-5066
X21	1252-1404	6	1	CONN-POST 34-CONT	28480	7834-0000T
	04278-61624	0	1	FL CBL ASSY 34P	28480	04278-61624
	04278-61629	5	1	FL CBL ASSY 34P	28480	04278-61629

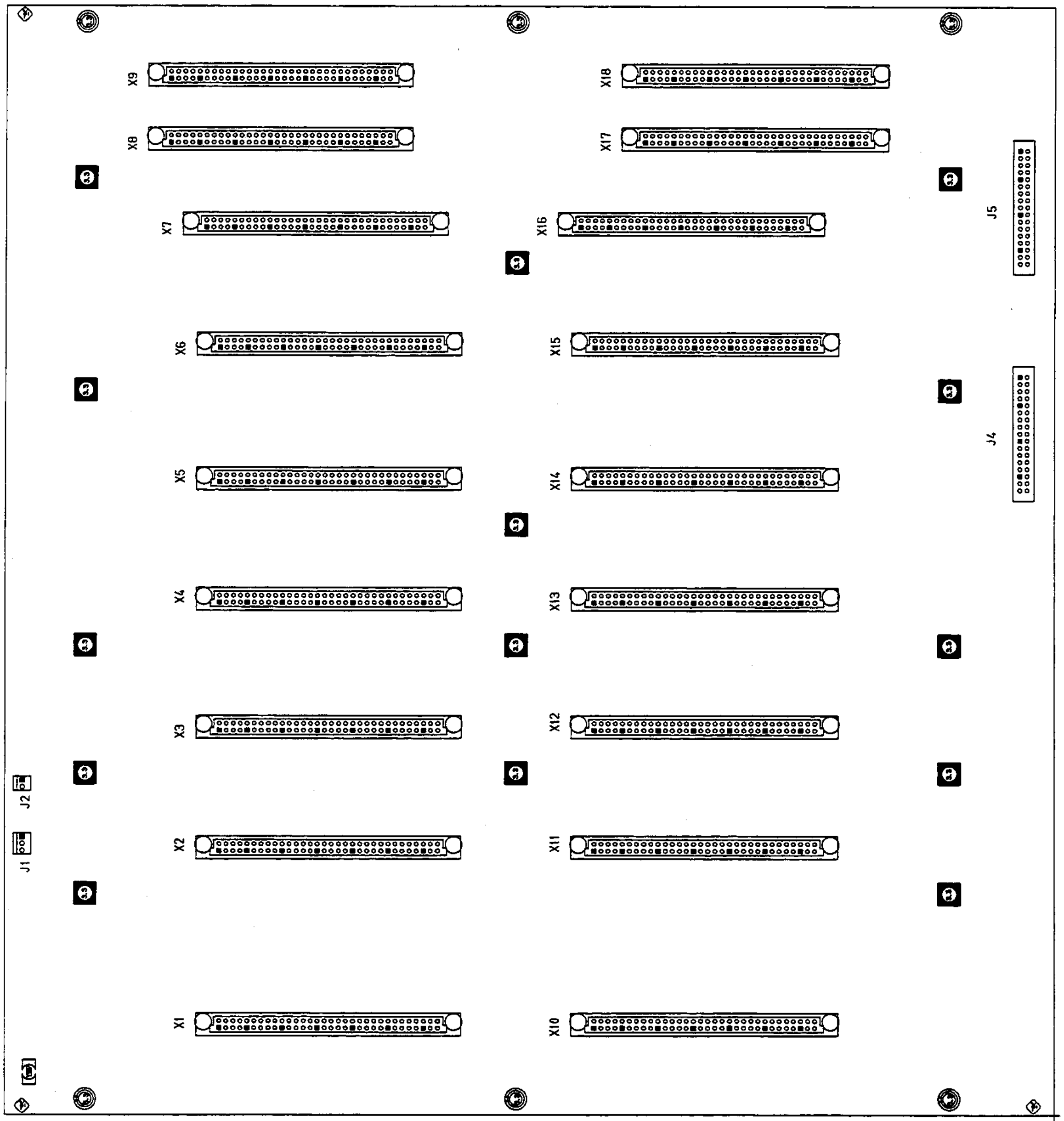


Figure 4-A11-1. A11 Motherboard Component Locations

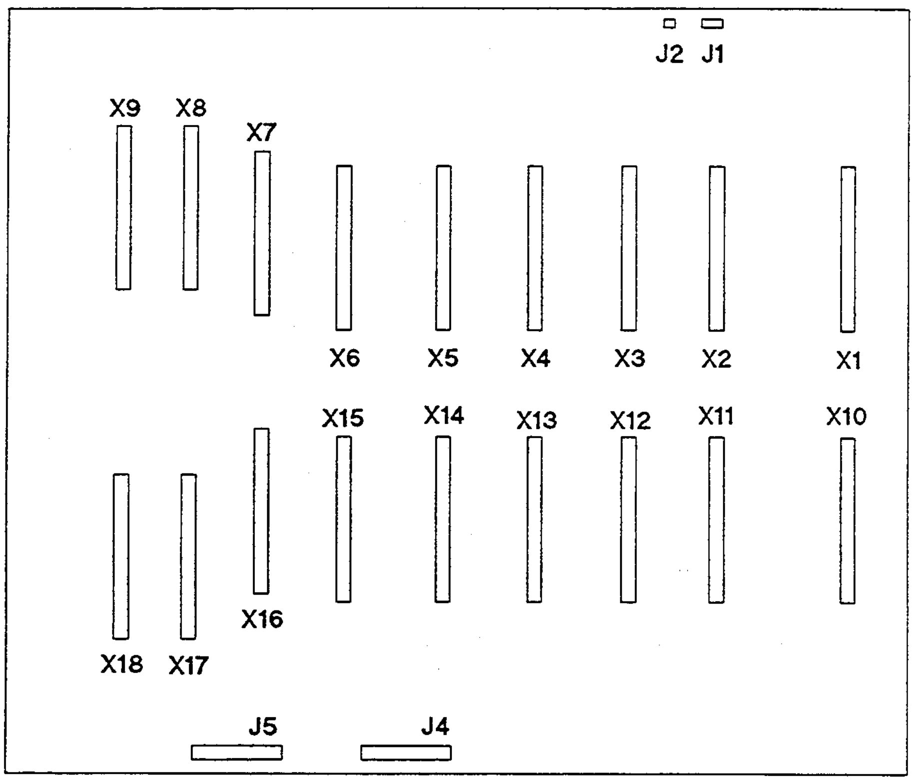


Figure 4-A11-1. Pin Assginment on the A11 Circuit Side

PIN ASSIGNMENTS ON THE A11 CIRCUIT SIDE

J2

1	LGND
2	REAR_TRG_INT

J1

1	+12VFAN
2	FANCTL
3	-12VFAN

X9

B		A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5VL	4	+5VL
+5VL	5	+5VL
+5VL	6	+5VL
+12VL	7	+12VL
nc	8	nc
A14	9	A15
A12	10	A13
A10	11	A11
A8	12	A9
A6	13	A7
A4	14	A5
A2	15	A3
/HANDLER	16	A1
LGND	17	LGND
D14	18	D15
D12	19	D13
D10	20	D11
D8	21	D9
D6	22	D7
D4	23	D5
D2	24	D3
D0	25	D1
LGND	26	/POW_FAIL
/VPA	27	/VMA
/RESET	28	E
R/W	29	LGND
/UDS	30	/LDS
/KEY_LOCK_INT	31	/HDL_TRG_INT
/CLK16MHz	32	LGND

X8

B		A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5VL	4	+5VL
+5VL	5	+5VL
+5VL	6	+5VL
+12VL	7	+12VL
-12VL	8	-12VL
A14	9	A15
A12	10	A13
A10	11	A11
A8	12	A9
A6	13	A7
A4	14	A5
A2	15	A3
/INT_TO_STD_IF	16	A1
LGND	17	/STD_IF
D14	18	D15
D12	19	D13
D10	20	D11
D8	21	D9
D6	22	D7
D4	23	D5
D2	24	D3
D0	25	D1
LGND	26	LGND
/DTACK	27	LGND
/RESET	28	/HALT
R/W	29	LGND
/UDS	30	/LDS
LGND	31	/INT_FROM_STD_IF
/CLK16MHz	32	LGND

X7

B		A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5VL	4	+5VL
+5VL	5	+5VL
+5VL	6	+5VL
LGND	7	LGND
LGND	8	LGND
+5V_MEM_CARD	9	+5V_MEM_CARD
A19	10	A20
A17	11	A18
A15	12	A16
A13	13	A14
A11	14	A12
A9	15	A10
A7	16	A8
A5	17	A6
A3	18	A4
A1	19	A2
/HANDLER	20	/KEY_DSP_CTL
/SCANNER	21	/OPT_BD
/MEM_CARD	22	/INT_TO_STD_IF
/CS7	23	/CS6
/EXT_RESERVE	24	/STD_IF
D14	25	D15
D12	26	D13
D10	27	D11
D8	28	D9
D6	29	D7
D4	30	D5
D2	31	D3
D0	32	D1

X6

B		A
AGND	1	AGND
AGND	2	AGND
AGND	3	AGND
+8V	4	+8V
+12V	5	+12V
-12V	6	-12V
+15V	7	+15V
-15V	8	-15V
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
AGND	12	AGND
AD-CLK	13	AD-CLK
AGND	14	AGND
8F	15	8F
AGND	16	AGND
F	17	F
AGND	18	AGND
nc	19	nc
AGND	20	AGND
AGND	21	AGND
AGND	22	AGND
AGND	23	AGND
AGND	24	AGND
ANL1	25	ANL1
AGND	26	AGND
ANL2	27	ANL2
AGND	28	AGND
nc	29	nc
AGND	30	AGND
nc	31	nc
AGND	32	AGND

X5

B		A
AGND	1	AGND
AGND	2	AGND
AGND	3	AGND
+8V	4	+8V
+12V	5	+12V
-12V	6	-12V
+15V	7	+15V
-15V	8	-15V
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
AGND	12	AGND
AD-CLK	13	AD-CLK
AGND	14	AGND
8F	15	8F
AGND	16	AGND
F	17	F
AGND	18	AGND
nc	19	nc
AGND	20	AGND
nc	21	nc
AGND	22	AGND
nc	23	nc
AGND	24	AGND
ANL1	25	ANL1
AGND	26	AGND
ANL2	27	ANL2
AGND	28	AGND
Loc0	29	Loc0
AGND	30	AGND
Loc90	31	Loc90
AGND	32	AGND

X4

B		A
AGND	1	AGND
AGND	2	AGND
AGND	3	AGND
+8V	4	+8V
+12V	5	+12V
-12V	6	-12V
+15V	7	+15V
-15V	8	-15V
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
AGND	12	AGND
+50V	13	+50V
AGND	14	AGND
-50V	15	-50V
AGND	16	AGND
nc	17	nc
AGND	18	AGND
nc	19	nc
AGND	20	AGND
nc	21	nc
AGND	22	AGND
nc	23	nc
AGND	24	AGND
ANL1	25	ANL1
AGND	26	AGND
ANL2	27	ANL2
AGND	28	AGND
Loc0	29	Loc0
AGND	30	AGND
Loc90	31	Loc90
AGND	32	AGND

X3

B		A
AGND	1	AGND
AGND	2	AGND
AGND	3	AGND
+8V	4	+8V
+12V	5	+12V
-12V	6	-12V
+15V	7	+15V
-15V	8	-15V
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
AGND	12	AGND
+50V	13	+50V
AGND	14	AGND
-50V	15	-50V
AGND	16	AGND
nc	17	nc
AGND	18	AGND
DC F.B.	19	DC F.B.
AGND	20	AGND
NULL_OUT	21	NULL_OUT
AGND	22	AGND
nc	23	nc
AGND	24	AGND
ANL1	25	ANL1
AGND	26	AGND
ANL2	27	ANL2
AGND	28	AGND
Loc0	29	Loc0
AGND	30	AGND
Loc90	31	Loc90
AGND	32	AGND

X2

B		A
AGND	1	AGND
AGND	2	AGND
AGND	3	AGND
+8V	4	+8V
+12V	5	+12V
-12V	6	-12V
+15V	7	+15V
-15V	8	-15V
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
AGND	12	AGND
nc	13	nc
AGND	14	AGND
nc	15	nc
AGND	16	AGND
nc	17	nc
AGND	18	AGND
DC F.B.	19	DC F.B.
AGND	20	AGND
NULL_OUT	21	NULL_OUT
AGND	22	AGND
nc	23	nc
AGND	24	AGND
ANL1	25	ANL1
AGND	26	AGND
ANL2	27	ANL2
AGND	28	AGND
Loc0	29	Loc0
AGND	30	AGND
Loc90	31	Loc90
AGND	32	AGND

X1

B		A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5VL	4	+5VL
+5VL	5	+5VL
+5VL	6	+5VL
+12VL	7	+12VL
-12VL	8	-12VL
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
+8V	12	+8V
+12V	13	+12V
-12V	14	-12V
+15V	15	+15V
-15V	16	-15V
nc	17	nc
+48V	18	+48V
nc	19	nc
-48V	20	-48V
nc	21	nc
-20V	22	-20V
nc	23	nc
-12VFAN	24	-12VFAN
+12VFAN	25	+12VFAN
FANCTL	26	FANCTL
nc	27	nc
/POWFAIL	28	/POWFAIL
nc	29	nc
nc	30	nc
nc	31	nc
nc	32	nc

X18

B		A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5VL	4	+5VL
+5VL	5	+5VL
+5VL	6	+5VL
+12VL	7	+12VL
-12VL	8	-12VL
A14	9	A15
A12	10	A13
A10	11	A11
A8	12	A9
A6	13	A7
A4	14	A5
A2	15	A3
/SCANNER	16	A1
LGND	17	LGND
D14	18	D15
D12	19	D13
D10	20	D11
D8	21	D9
D6	22	D7
D4	23	D5
D2	24	D3
D0	25	D1
/DTACK	26	/POW_FAIL
/VPA	27	/VMA
/RESET	28	E
R/W	29	LGND
/UDS	30	/LDS
LGND	31	/SCANNER_INT
/CLK16MHz	32	LGND

X17

B		A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5VL	4	+5VL
+5VL	5	+5VL
+5VL	6	+5VL
+12VL	7	+12VL
-12VL	8	-12VL
A14	9	A15
A12	10	A13
A10	11	A11
A8	12	A9
A6	13	A7
A4	14	A5
A2	15	A3
/OPT_BD	16	A1
LGND	17	LGND
D14	18	D15
D12	19	D13
D10	20	D11
D8	21	D9
D6	22	D7
D4	23	D5
D2	24	D3
D0	25	D1
/DTACK	26	/POW_FAIL
/VPA	27	/VMA
/RESET	28	E
R/W	29	LGND
/UDS	30	/LDS
/ID6	31	/OPT_BD_INT
/CLK16MHz	32	LGND

X16

B		A
LGND	1	LGND
/VPA	2	/VMA
/DTACK	3	E
/RESET	4	/HALT
R/W	5	/AS
/UDS	6	/LDS
CARD_R/W	7	/CARD_LDS
/KBD_INT	8	/REAR_TRG_INT
/EOC_INT	9	/HDL_TRG_INT
/KEY_LOCK_INT	10	/INT_FROM_STD_IF
/SCANNER_INT	11	/OPT_BD_INT
LGND	12	CLK2MHz
/CLK16MHz	13	CLK8MHz
LGND	14	LGND
/ACs1	15	/ACs0
/ACs3	16	/ACs2
/ACs5	17	/ACs4
/ACs7	18	/ACs6
/ANLDS	19	ANR/W
LGND	20	LGND
ANA5	21	ANA6
ANA3	22	ANA4
ANA1	23	ANA2
AND6	24	AND7
AND4	25	AND5
AND2	26	AND3
AND0	27	AND1
LGND	28	LGND
/ID6	29	/ID7
/ID4	30	/ID5
/ID2	31	/ID3
/ID0	32	/ID1

X15

B		A
nc	1	nc
nc	2	nc
nc	3	nc
nc	4	nc
nc	5	nc
AGND	6	AGND
AGND	7	AGND
/EOC_INT	8	/POWFAIL
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
/ACs1	12	/ACs0
/ACs3	13	/ACs2
/ACs5	14	/ACs4
/ACs7	15	/ACs6
/ANLDS	16	ANR/W
ANA3	17	ANA4
ANA1	18	ANA2
AND6	19	AND7
AND4	20	AND5
AND2	21	AND3
AND0	22	AND1
/ID6	23	/ID7
/ID4	24	/ID5
/ID2	25	/ID3
/ID0	26	/ID1
nc	27	nc
/RESET	28	nc
nc	29	nc
AGND	30	AGND
AGND	31	AGND
AGND	32	AGND

X14

B		A
nc	1	nc
nc	2	nc
nc	3	nc
nc	4	nc
nc	5	nc
AGND	6	AGND
AGND	7	AGND
/EOC_INT	8	/POWFAIL
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
/ACs1	12	/ACs0
/ACs3	13	/ACs2
/ACs5	14	/ACs4
/ACs7	15	/ACs6
/ANLDS	16	ANR/W
ANA3	17	ANA4
ANA1	18	ANA2
AND6	19	AND7
AND4	20	AND5
AND2	21	AND3
AND0	22	AND1
/ID6	23	/ID7
/ID4	24	/ID5
/ID2	25	/ID3
/ID0	26	/ID1
nc	27	nc
/RESET	28	nc
nc	29	nc
AGND	30	AGND
AGND	31	AGND
AGND	32	AGND

X13

B		A
nc	1	nc
nc	2	nc
nc	3	nc
nc	4	nc
nc	5	nc
AGND	6	AGND
AGND	7	AGND
/EOC_INT	8	/POWFAIL
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
/ACs1	12	/ACs0
/ACs3	13	/ACs2
/ACs5	14	/ACs4
/ACs7	15	/ACs6
/ANLDS	16	ANR/W
ANA3	17	ANA4
ANA1	18	ANA2
AND6	19	AND7
AND4	20	AND5
AND2	21	AND3
AND0	22	AND1
/ID6	23	/ID7
/ID4	24	/ID5
/ID2	25	/ID3
/ID0	26	/ID1
nc	27	nc
/RESET	28	nc
nc	29	nc
AGND	30	AGND
AGND	31	AGND
AGND	32	AGND

X12

B		A
nc	1	nc
nc	2	nc
nc	3	nc
nc	4	nc
nc	5	nc
AGND	6	AGND
AGND	7	AGND
/EOC_INT	8	/POWFAIL
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
/ACs1	12	/ACs0
/ACs3	13	/ACs2
/ACs5	14	/ACs4
/ACs7	15	/ACs6
/ANLDS	16	ANR/W
ANA3	17	ANA4
ANA1	18	ANA2
AND6	19	AND7
AND4	20	AND5
AND2	21	AND3
AND0	22	AND1
/ID6	23	/ID7
/ID4	24	/ID5
/ID2	25	/ID3
/ID0	26	/ID1
nc	27	nc
/RESET	28	nc
nc	29	nc
AGND	30	AGND
AGND	31	AGND
AGND	32	AGND

X11

B		A
nc	1	nc
nc	2	nc
nc	3	nc
nc	4	nc
nc	5	nc
AGND	6	AGND
AGND	7	AGND
/EOC_INT	8	/POWFAIL
AGND	9	AGND
AGND	10	AGND
AGND	11	AGND
/ACs1	12	/ACs0
/ACs3	13	/ACs2
/ACs5	14	/ACs4
/ACs7	15	/ACs6
/ANLDS	16	ANR/W
ANA3	17	ANA4
ANA1	18	ANA2
AND6	19	AND7
AND4	20	AND5
AND2	21	AND3
AND0	22	AND1
/ID6	23	/ID7
/ID4	24	/ID5
/ID2	25	/ID3
/ID0	26	/ID1
nc	27	nc
/RESET	28	nc
nc	29	nc
AGND	30	AGND
AGND	31	AGND
AGND	32	AGND

X10

B		A
nc	1	nc
nc	2	nc
nc	3	nc
nc	4	nc
nc	5	nc
nc	6	nc
nc	7	nc
nc	8	nc
nc	9	nc
nc	10	nc
nc	11	nc
nc	12	nc
nc	13	nc
nc	14	nc
nc	15	nc
nc	16	nc
nc	17	nc
nc	18	nc
nc	19	nc
nc	20	nc
nc	21	nc
nc	22	nc
nc	23	nc
nc	24	nc
nc	25	nc
nc	26	nc
nc	27	nc
nc	28	nc
nc	29	nc
nc	30	nc
nc	31	nc
nc	32	nc

J5

A		B
+5V_MEM_CARD	1	nc
CARD_R/W	2	nc
nc	3	nc
A9	4	A10
A12	5	/CARD_LDS
A11	6	/MEM_CARD
D7	7	D6
D5	8	D4
D3	9	LGND
nc	10	LGND
D2	11	D1
D0	12	A1
A2	13	A3
A4	14	A5
A6	15	A7
A8	16	A13
nc	17	+5V_MEM_CARD

J4

A		B
LGND	1	LGND
LGND	2	LGND
+5VL	3	+5VL
-20V	4	-20V
+12VL	5	+12VL
-12VL	6	-12VL
LGND	7	LGND
A15	8	A14
A2	9	A1
/KEY_DSP_CTL	10	LGND
D7	11	D6
D5	12	D4
D3	13	D2
D1	14	D0
/RESET	15	R/W
/LDS	16	/KBD_INT
LGND	17	/CLK16MHz

4-18. A20 HP-IB INTERFACE SERVICE SHEET

4-18-1. CIRCUIT DESCRIPTION

The A20 HP-IB Interface board handles all HP-IB interface functions. The HP-IB Interface board controls the handshaking between the Microprocessor and external HP-IB controlled equipment.

4-18-2. TROUBLESHOOTING AIDS

The test points are listed in Table 4-A20-1.

Table 4-A20-1. A20 Test Points

Test Point	Signal Name	Description
A20TP1	*GND*	Ground reference for the +5 V digital supply
A20TP2	*+5V*	+5 V digital supply
A20TP3	*LDS*	Lower Data Strobe Signal
A20TP4	*4MHz*	4 MHz is counted down from the A7 */CLK16MHz*

4-18-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A20 HP-IB Interface board are listed in Table 4-A20-2.

4-18-4. COMPONENT LOCATIONS

The A20 HP-IB Interface board component locations are shown in Figure 4-A20-1.

4-18-5. SCHEMATIC DIAGRAMS

The A20 HP-IB Interface board schematic diagram is shown in Figure 4-A20-2.

Table 4-A20-2. A20 HP-IB Interface Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A20						
A20	04284-66520	3	1	HP-IB IF	28480	04284-66520
C1	0180-3590	1	1	CAPACITOR-FXD 470UF 10V AL	28480	0180-3590
C2	0160-6561	0	7	CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C3	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C4	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C5	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C6	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C7	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C8	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
DS1	1990-0665	3	1	LED-VSBL (RED)	28480	1990-9665
F1	2110-0742	4	1	FUSE 1.5A 125V	28480	2110-0741
J1	1251-5650	0	1	CONN-POST TYPE	28480	1251-5650
R1	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8/T0-4641-F
R2	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8/T0-511R-F
U1	1820-2485	0	1	IC SN75160AN	28480	1820-2485
U2	1820-2483	8	1	IC SN75161AN	28480	1820-2483
U3	1820-2548	6	1	TMS9914ANL	28480	1820-2548
U4	1820-1433	6	1	IC SN74LS164 N	28480	1820-1433
U5	1820-2777	3	1	IC SN74ALS161 N	28480	1820-2777
U6	1820-2657	8	1	IC SN74ALS32N	28480	1820-2657
U7	1820-2634	1	1	IC SN74ALS04N	28480	1820-2634
U8	1820-3376	0	1	IC SN74ALS05AN	28480	1820-3376
U9	1820-3707	1	1	IC-74ALS541	28480	1820-3707
U10	1820-3121	3	1	IC SN74ALS245	28480	1820-3121
W1	8159-0005	0	1	RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
X1	1252-1598	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	4040-0748	3	1	EXTR-PC BD BLK	28480	4040-0748
	4040-0750	7	1	EXTR-PC BD RED	28480	4040-0750

NOTES

4:Service Sheets

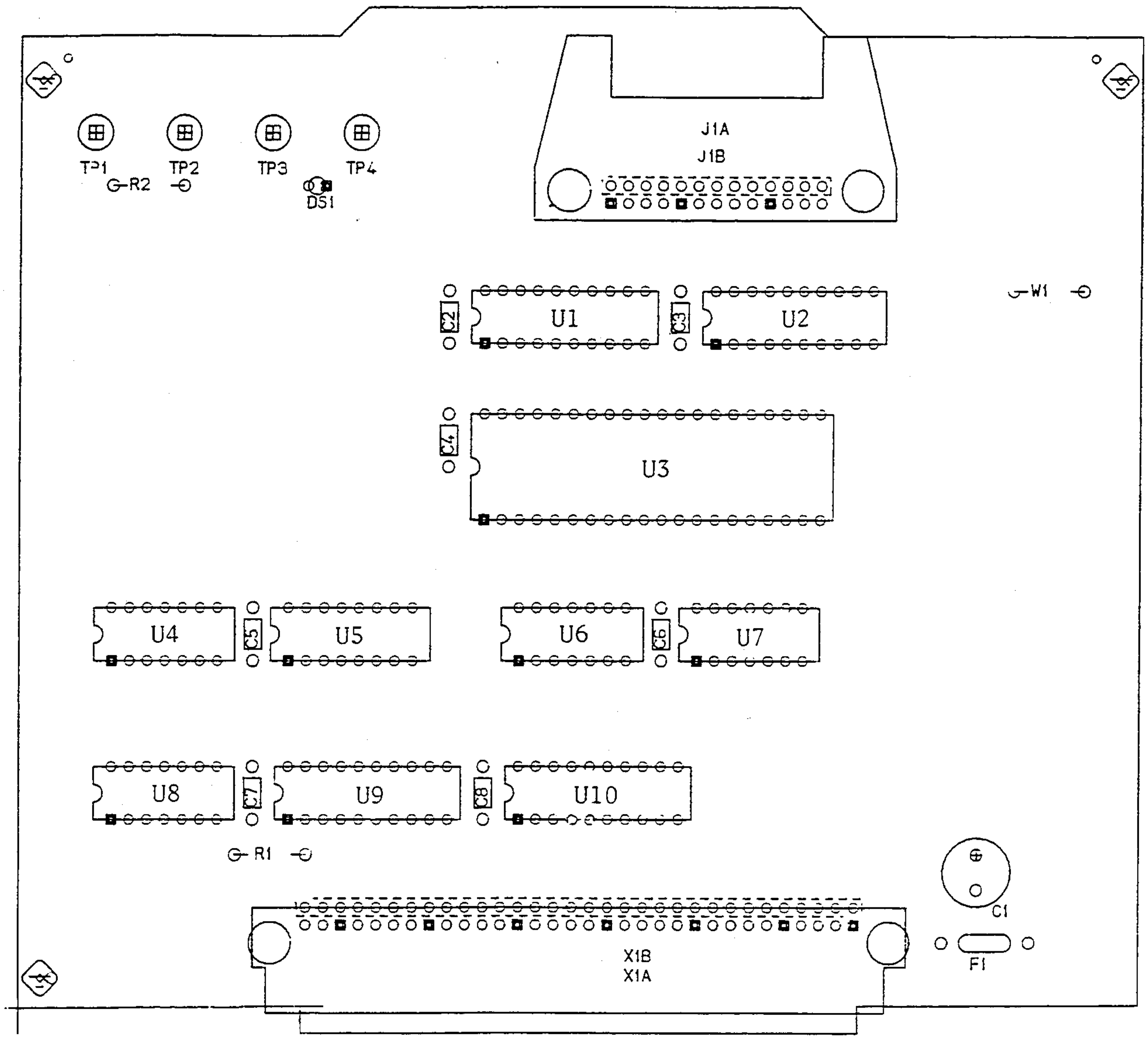


Figure 4-A20-1. A20 HP-IB Interface Component Locations

A20 HP-IB INTERFACE

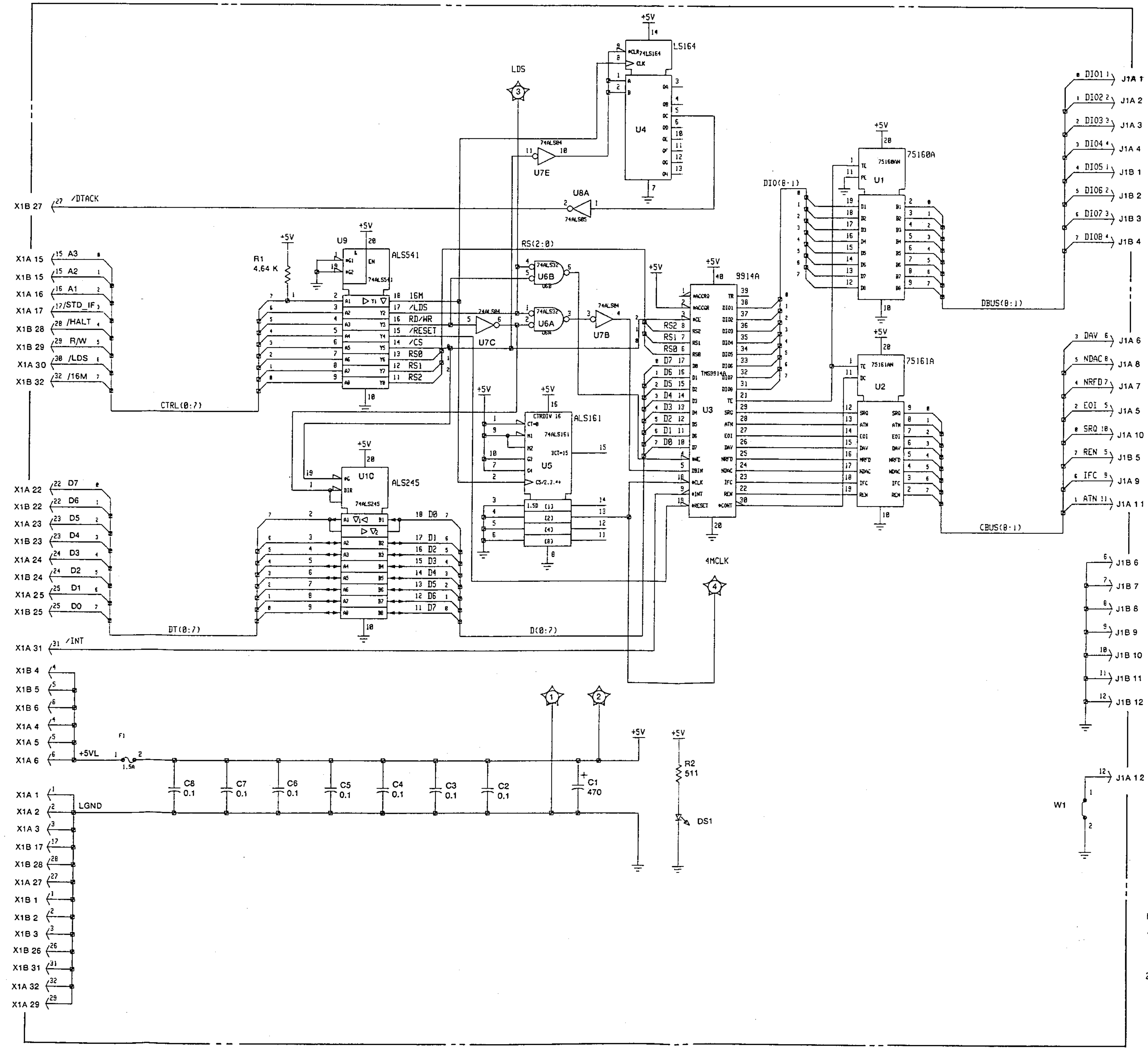


Figure 4-A20-2. A20 HP-IB Interface Schematic Diagram

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.

2. UNLESS OTHERWISE INDICATED:

   RESISTANCE IN OHMS (Ω)
   CAPACITANCE IN MICROFARADS (μF)
   INDUCTANCE IN MICROHENRIES (μH)

4-19. A30 HANDLER INTERFACE (OPT.201) SERVICE SHEET

4-19-1. CIRCUIT DESCRIPTION

The A30 handler interface board consists of photo couplers, and the peripheral interface adapters.

[Photo Couplers]

Photo couplers A30U1 through A30U7 opto-isolate the input and output signals. Jumpers (A30W1 through A30W11) are set according to the pull up voltages used. For more detail information about the input/output signals and jumpers, refer to the handler interface operation note in the HP 4284A operation manual.

[Peripheral Interface Adapters]

A30U13 and A30U14 are peripheral interface adapters (PIAs) which interface between the A7 CPU board and the A30 board.

4-19-2. TROUBLESHOOTING AIDS

The test points are listed in Table 4-A30-1.

Table 4-A30-1. Test Point List

Test Point	Signal Name	Description
A30TP1	*GND*	Ground line
A30TP2	*+5V*	+ 5 V DC
A30TP3	*BE*	792 kHz Clock signal
A30TP4		EXT.TRIG signal

4-19-3. REPLACEABLE PARTS LISTS

The replaceable parts of the A30 handler interface board are listed in Table 4-A30-2.

4-19-4. COMPONENT LOCATIONS

The component locations of the A30 handler interface board and the board connector pin assignments are shown in Figure 4-A30-1.

4-19-5. SCHEMATIC DIAGRAMS

The schematic diagram of the A30 handler interface board is shown in Figure 4-A30-2.

Table 3-1. A30 Handler Interface Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A30	04278-66530	7	1	HANDLER IF (OPTION 201)	28480	04278-66530
C1	0180-3602	6	1	CAPACITOR-FXD 22UF +-20% 50VDC AL	28480	0180-3602
C2	0180-3363	6	2	CAPACITOR-FXD 22UF +-20% 25VDC CER	28480	0180-3363
C3	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C4	0160-6561	0	4	CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C5	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C6	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C7	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C8	0180-3363	6		CAPACITOR-FXD 22UF +-20% 25VDC CER	28480	0180-3363
C9	0180-3217	9	1	CAPACITOR-FXD 470UF+_20% 6.3VDC AL	28480	0180-3217
C10	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
F1	2110-0741	3	1	FUSE 1A 125V NTD VL	28480	2110-0741
J1	1251-5652	2	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	28480	1251-5652
R1	0698-6360	6	1	RESISTOR 10K .1% .125W F TC=0+-25	28480	0698-6360
R2	0698-6362	8	2	RESISTOR 1K 1% .125W F TC=0+-25	28480	0698-6362
R3	0698-3441	8	18	RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R4	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R5	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R6	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R7	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R8	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R9	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R10	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R11	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R12	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R13	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R14	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R15	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R16	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R17	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R18	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R19	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R20	0698-3441	8		RESISTOR 215 1% .125W F TC=0+-100	24546	C4-1/8/T0-215R-F
R21	0698-0082	7	3	RESISTOR 414 1% .125W F TC=0+-100	24546	C4-1/8/T0-4640-F
R22	0698-0082	7		RESISTOR 414 1% .125W F TC=0+-100	24546	C4-1/8/T0-4640-F
R23	0698-0082	7		RESISTOR 414 1% .125W F TC=0+-100	24546	C4-1/8/T0-4640-F
R24	0757-0420	3	1	RESISTOR 750 1% .125W F TC=0+-100	24546	C4-1/8/T0-751-F
R25	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	C4-1/8/T0-316R-F
R26	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8/T0-511R-F
R27	0698-6362	8		RESISTOR 1K .1% .125W F TC=0+-25	28480	0698-6362
R28	1810-0279	5	1	NETWORK-RES 10-SIP 4.7K OHM X 9	91637	CSC10A01-472G/MSP
R29	0757-0420	2	1	RESISTOR 10 1% .125W F TC=0+-100	28480	0757-0346
R30	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4641-F
U1	1990-1179	0	5	PHOTO COUPLER	28480	1990-1179
U2	1990-1179	0		PHOTO COUPLER	28480	1990-1179
U3	1990-1179	0		PHOTO COUPLER	28480	1990-1179
U4	1990-1179	0		PHOTO COUPLER	28480	1990-1179
U5	1990-1180	0		PHOTO COUPLER	28480	1990-1180
U6	1990-1179	6		PHOTO COUPLER	28480	1990-1179
U7	1990-0602	8	1	OPTO-ISOLATOR LED-IC GATE IF=20MA MAX	28480	5082-4361
U8	1820-2711	5	4	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N

*** Indicates factory selected value.**

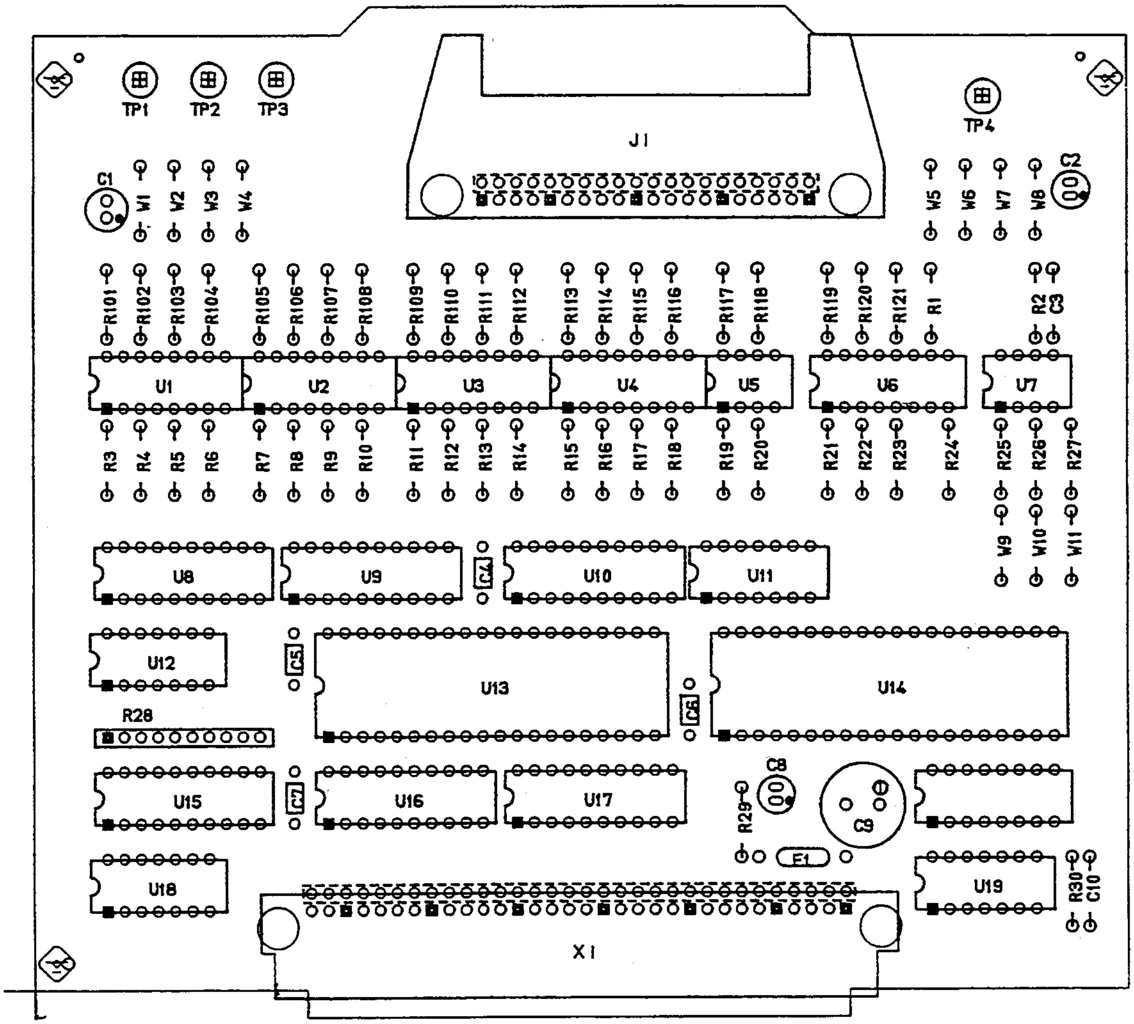
Table 3-1. A30 Handler Interface Replaceable Parts List

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
U9	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U10	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U11	1820-1197	9	1	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
U12	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U13	1820-4888	1	2	CMOS 6321P	28480	1820-4888
U14	1820-4888	1		CMOS 6321P	28480	1820-4888
U15	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U16	1820-2075	4	2	IC TRANSCEIVER LS BUS OCTL	01295	SN74LS245N
U17	1820-2075	4		IC TRANSCEIVER LS BUS OCTL	01295	SN74LS245N
U18	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
U19	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
W4	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W7	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W11	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
X1	1252-1589	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	4040-0751	8	1	EXTR-PC BD ORN POLYC .062-BD-THNKS	28480	4040-0751

* Indicates factory selected value.

4:Service Sheets

A30J1B	Pin No.	A30J1A
nc	20	nc
nc	19	nc
EXT.DCV1_COM	18	+5V
EXT.DCV1_COM	17	+5V
EXT.DCV1_COM	16	+5V
EXT.DCV2_COM	15	EXT.DCV2
EXT.DCV2_COM	14	EXT.DCV2
/EOM	13	/EXT_TRIG
/INDEX	12	/EXT_TRIG
/ALARM	11	/AUX_BIN
EXT.DCV1	10	OUT_OF_BINS
EXT.DCV1	9	/BIN9
nc	8	/BIN8
/KEYLOCK	7	/BIN7
/UNABL	6	/BIN6
nc	5	/BIN5
nc	4	/BIN4
/SREJ	3	/BIN3
/PLO	2	/BIN2
/PHI	1	/BIN1



A30X1B	Pin No.	A30X1A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5V	4	+5V
+5V	5	+5V
+5V	6	+5V
+12V	7	+12V
LGND	8	LGND
nc	9	nc
nc	10	nc
nc	11	nc
nc	12	nc
nc	13	nc
nc	14	nc
nc	15	nc
/HANDLER	16	A1
LGND	17	LGND
D14	18	D15
D12	19	D13
D10	20	D11
D8	21	D9
D6	22	D7
D4	23	D5
D2	24	D3
D0	25	D1
LGND	26	/POW_FAIL
/VPA	27	/VMA
/RESET	28	E
R/W	29	LGND
/UDS	30	/LDS
/KEY_LOCK_INT	31	/HDL_TRG_INT
nc	32	LGND

Figure 4-A30-1. A30 Handler Interface Component Locations

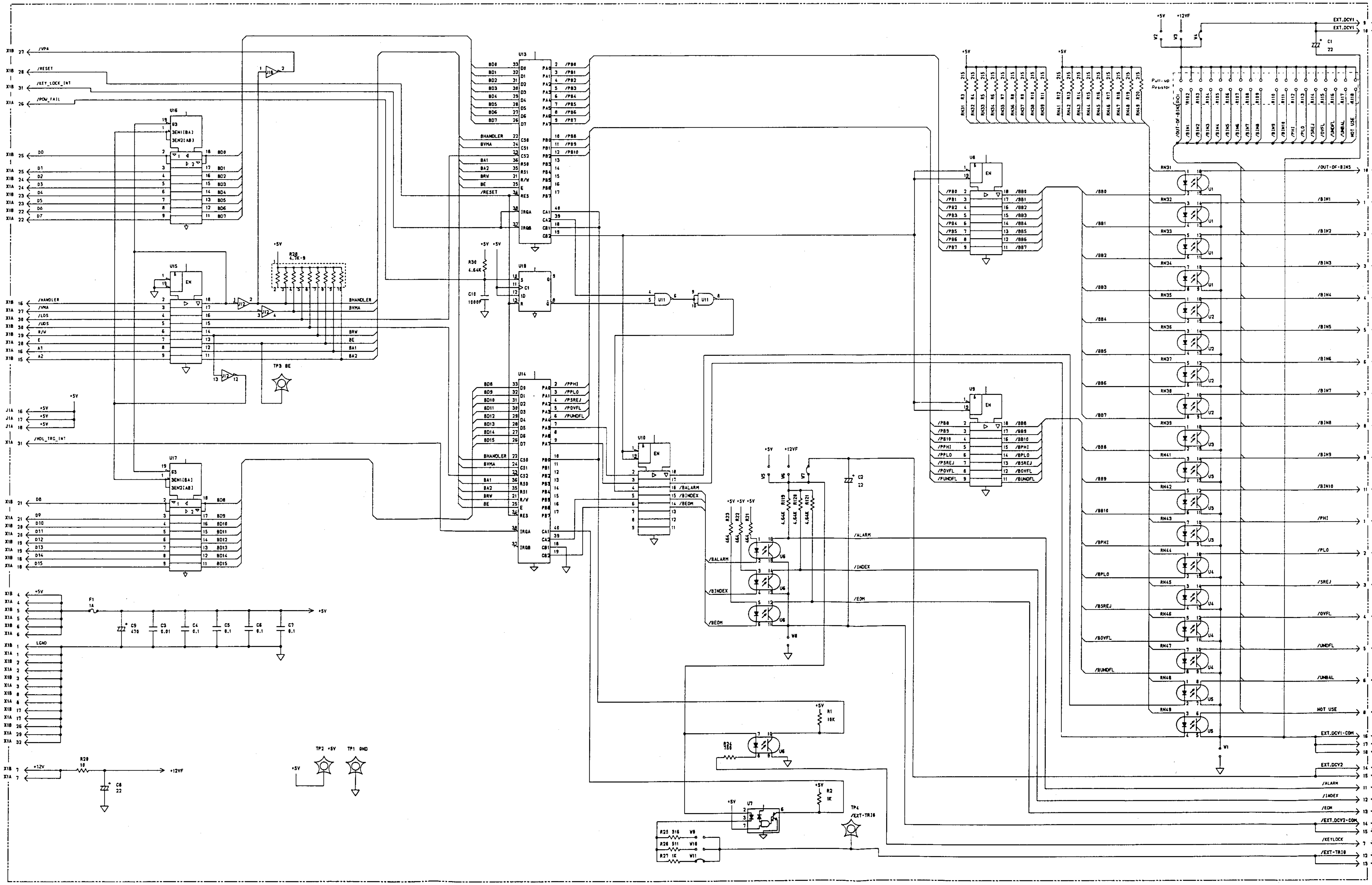


Figure 4-A30-2. A30 Handler Interface Schematic Diagram.

NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.

2. UNLESS OTHERWISE INDICATED:

RESISTANCE IN OHMS (Ω)
CAPACITANCE IN MICROFARADS (μF)
INDUCTANCE IN MICROHENRIES (μH)

4-20. A31 HANDLER INTERFACE (OPT.202) SERVICE SHEET

4-20-1. CIRCUIT DESCRIPTION

The A31 handler interface board consists of photo couplers, and peripheral interface adapters (PIAs).

[Photo Couplers]

Photo couplers A31U1 through A31U14 opto-isolate the input and output signals. Then timing of the input/output signals is determined by setting jumpers A31W3 through A31W13. For more detail information about the input/output signals and the jumpers, refer to the handler interface operation note in the HP 4278A Operation Manual.

[Peripheral Interface Adapters]

Peripheral interface adapters (PIAs) A31U19 and A31U20 interface between the A7 CPU board and the A31 board.

4-20-2. TROUBLESHOOTING AIDS

The test points are listed in Table 4-A31-1.

Table 4-A31-1. Test Point List

Test Point	Signal Name	Description
A31TP1	*GND*	Ground line
A31TP2	*+5V*	+5 V DC
A31TP3	*BE*	792 kHz Clock signal
A31TP4		START IN signal

4-20-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A31 Handler Interface board are listed in Table 4-A31-2.

4-20-4. COMPONENT LOCATIONS

The component locations on the A31 Handler Interface board and the board connector pin assignments are shown in Figure 4-A31-1.

4-20-5. SCHEMATIC DIAGRAMS

The schematic diagram of the A31 handler interface board is shown in Figure 4-A31-2.

Table 4-A31-2. A31 Handler Interface Replaceable Parts List (1/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A31						
A31	04278-66531	2	1	HANDLER IF (OPTION 202)	28480	04278-66531
C1	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C2	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
C3	0160-6561	0	5	CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C4	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C5	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C6	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C7	0160-6561	0		CAPACITOR-FXD 0.1UF +-20% 50VDC CER	16299	CAC02Z5U104M050A
C8	0180-3217	0	1	CAPACITOR-FXD 470UF +-20% 6.3VDC AL	16299	CAC02Z5U104M050A
DS1	0990-0665	6	1	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4684
F1	2110-0741	3	1	FUSE 1A 125V NTD VL	28480	2110-0741
J1	1251-5652	2	1	CONN-POST TYPE .100-PIN-SPCG 40-CONT	28480	1251-5652
R1	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
R2	0698-3440	7	13	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R3	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R4	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R5	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R6	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R7	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R8	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R9	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R10	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R11	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R12	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R13	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R14	0698-3440	7		RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8/T0-196R-F
R15	0757-0280	3	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
R16	1810-0279	5	1	NETWORK-RES 10-SIP 4.7K OHM X 9	91637	CSC10A01-472G/MSP
U1	1990-1199	0	13	OPTO-ISOLATOR	28480	1990-1199
U2	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U3	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U4	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U5	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U6	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U7	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U8	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U9	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U10	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U11	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U12	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U13	1990-1199	0		OPTO-ISOLATOR	28480	1990-1199
U14	1990-0655	1	1	OPTO-ISOLATOR	28480	1990-0655
U15	1820-2711	5	3	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U16	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U17	1820-1416	5	1	IC SCHMITT TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
U18	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U19	1820-4888	1	2	CMOS 6321P	28480	1820-4888
U20	1820-4888	1		CMOS 6321P	28480	1820-4888

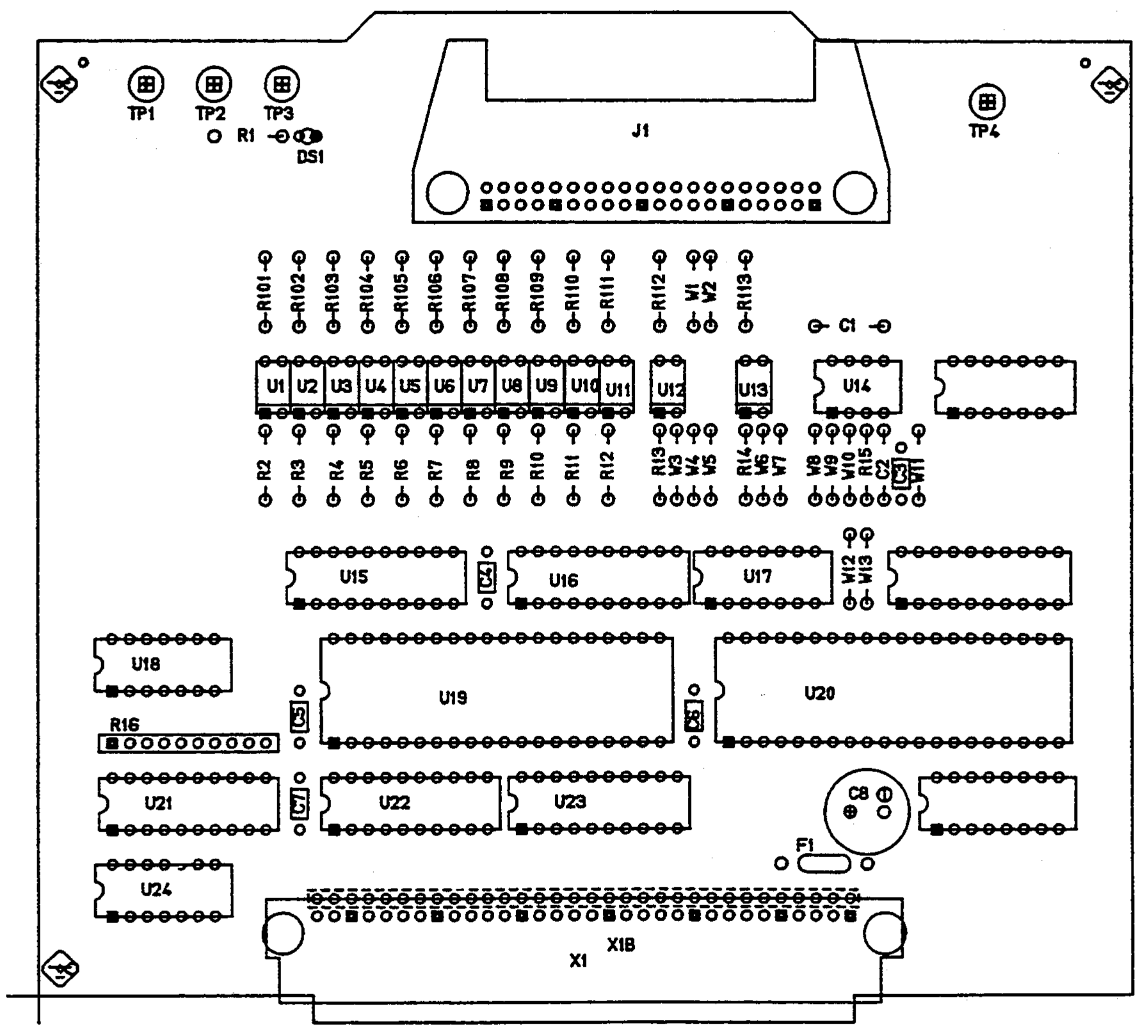
*** Indicates factory selected value.**

Table 4-A31-2. A31 Handler Interface Replaceable Parts List (2/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
U21	1820-2711	5		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS541N
U22	1820-2075	4	2	IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS00N
U23	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS00N
U24	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
W6	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W9	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W10	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
W13	8159-0005	0		RESISTOR-ZERO OHMS 22 AWG LEAD DIA	28480	8159-0005
X1	1252-1589	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96-CONT	09922	PI96B30P00F50N9
	4040-0749	4	1	EXTR-PC BD BRN POLYC .062-BD-THKNS	28480	4040-0749
	4040-0751	8	1	EXTR-PC BD ORN POLYC .062-BD-THNKS	28480	4040-0751

* Indicates factory selected value.

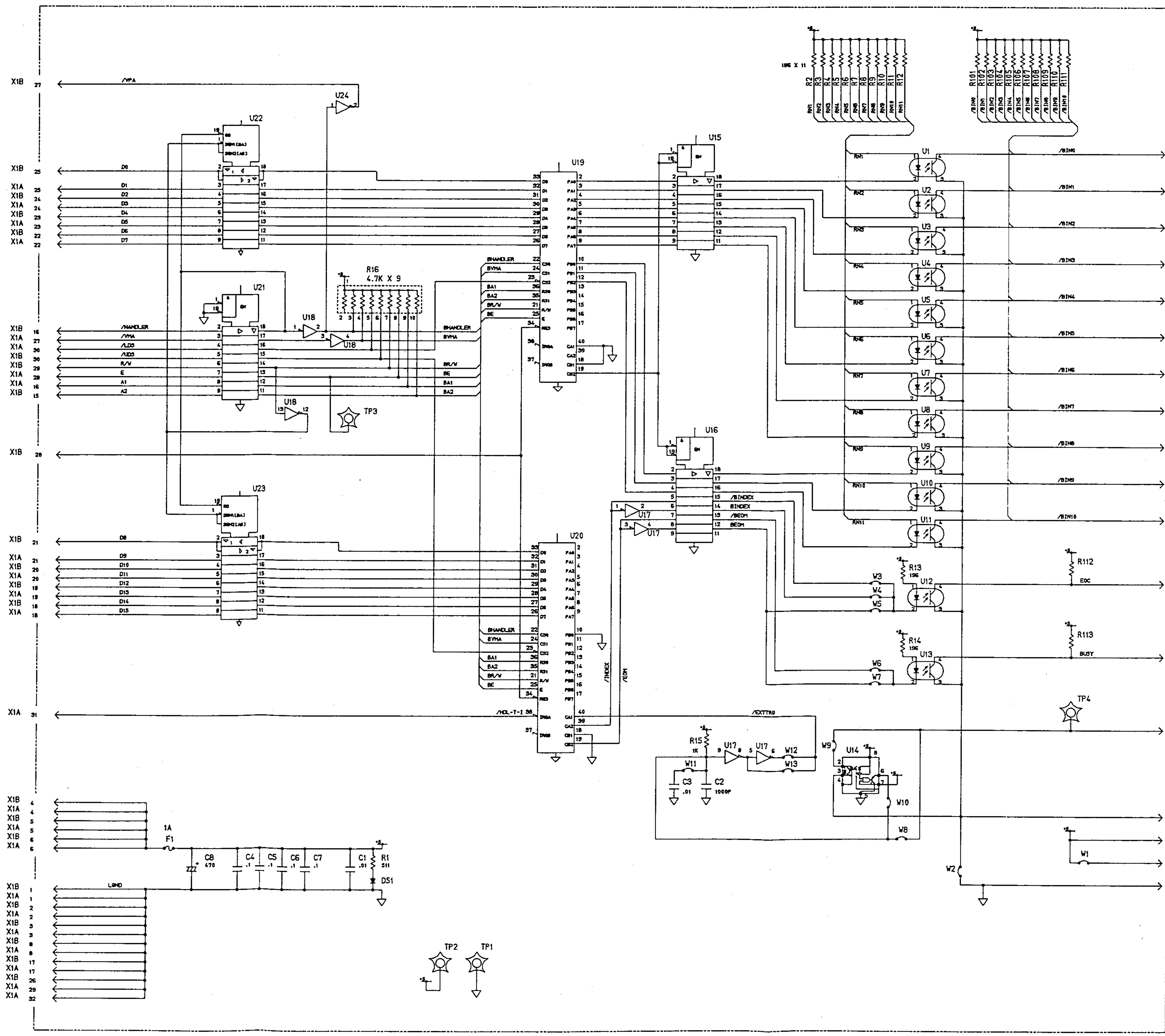
Pin No.	A31J1A	A31J1B
1	COMMON	nc
2	/BIN0	nc
3	/BIN1	nc
4	/BIN2	nc
5	/BIN3	nc
6	/BIN4	nc
7	/BIN5	nc
8	/BIN6	nc
9	/BIN7	nc
10	/BIN8	nc
11	/BIN9	nc
12	+5 OUT	nc
13	SYSTEM GROUND	nc
14	START IN	nc
15	EOC	nc
16	/BIN10	nc
17	nc	nc
18	BUSY	nc
19	nc	nc
20	nc	nc



Pin No.	A31X1A	A31X1B
1	LGND	LGND
2	LGND	LGND
3	LGND	LGND
4	+5V	+5V
5	+5V	+5V
6	+5V	+5V
7	nc	nc
8	LGND	LGND
9	nc	nc
10	nc	nc
11	nc	nc
12	nc	nc
13	nc	nc
14	nc	nc
15	nc	nc
16	A1	/HANDLER
17	LGND	LGND
18	D15	D14
19	D13	D12
20	D11	D10
21	D9	D8
22	D7	D6
23	D5	D4
24	D3	D2
25	D0	D1
26	LGND	nc
27	/VPA	/VMA
28	/RESET	E
29	R/W	LGND
30	/UDS	/LDS
31	nc	/HDL_TRG_INT
32	nc	LGND

Figure 4-A31-1. A31 Handler Interface Component Locations

A31 #202 HANDLER INTERFACE



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:

   RESISTANCE IN OHMS (Ω)
   CAPACITANCE IN MICROFARADS (μF)
   INDUCTANCE IN MICROHENRIES (μH)

Figure 4-A31-2. A31 Handler Interface Schematic Diagram.

4-21. A40 SCANNER INTERFACE (OPT.301) SERVICE SHEET

4-21-1. CIRCUIT DESCRIPTION

The A40 scanner interface board consists of photo couplers, EEPROMs, Static RAMs, and a peripheral interface adapter (PIA).

[Photo Couplers]

When the scanner interface connector on the rear panel is used to synchronize an external scanner, the input/output signals are opto-isolated by opto-couplers A40U3, A40U4, A40U5, and A40U6. The pull-up resistors for the input signals are selected using jumpers A40SW1 and A40SW2.

[EEPROMs]

EEPROMs A40U7 and A40U12 (64 KBytes) are used to store compensation data for 128 channels.

[Peripheral Interface Adapter]

Peripheral interface adapter (A40U9) interfaces between the A7 CPU board and the 40 board.

4-21-2. TROUBLESHOOTING AIDS

The test points are listed in Table 4-A40-1.

Table 4-A40-1. Test Points

Test Point	Signal Name	Description
A40TP1	*EXT_TRIG*	External trigger signal
A40TP2	*EXT_DCV*	External DC voltage
A40TP3	*COMMON*	Common line
A40TP4	*VCC*	+5 V DC
A40TP5	*GND*	Ground line

4-21-3. REPLACEABLE PARTS LISTS

The replaceable parts for the A40 Scanner Interface Board are listed in Table 4-A40-2.

4-21-4. COMPONENT LOCATIONS

The component locations on the A40 scanner interface board and the board connector pin assignments are shown in Figure 4-A40-1.

4-21-5. SCHEMATIC DIAGRAMS

The schematic diagram of the A40 Scanner Interface board is shown in Figure 4-A40-2.

Table 4-A40-2. A40 Scanner Interface Replaceable Parts list (1/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
A40						
A40	04278-66540	2	1	SCANNER INTERFACE (OPTION 301)	28480	04278-66540
C1	0180-3363	6	1	CAPACITOR-FXD 22UF+-20% 25VDC AL	28480	0180-3363
C2	0160-6561	0	6	CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C3	0160-4832	4	1	CAPACITOR-FXD .01F +-10% 100VDC CER	28480	0160-4832
C4	0160-4822	2	1	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
C5	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C6	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C7	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C8	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C9	0160-6561	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC02Z5U104M
C10	0180-3217	9	1	CAPACITOR-FXD 470UF +-20% 6.3VDC AL	28480	0160-4822
F1	2110-0742	4	1	FUSE 1.5A 125V NTD VL	28480	2110-0742
R1	0757-0421	4	18	RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R2	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R3	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R4	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R5	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R6	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R7	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R8	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R9	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R10	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R11	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R12	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R13	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R14	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R15	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R16	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R17	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R18	0757-0421	4		RESISTOR 825 1% .125W F TC=0+-100	24546	C4-1/8-T0-825R-F
R19	0757-0280	3	2	RESISTOR 1K 1% .125W F TC =0+-100	24546	C4-1/8-T0-1001-F
R20	0757-0416	7	1	RESISTOR 511 1% .125W F TC=0+-100	24546	CT4-1/8-T0-511R-F
R21	0698-3444	1	1	RESISTOR 316 1% .125W F TC=0+-100	24546	CT4-1/8-T0-316R-F
R22	0698-0082	7	2	RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R23	0698-0082	7		RESISTOR 464 1% .125W F TC=0+-100	24546	CT4-1/8-T0-4640-F
R24	0757-0280	3		RESISTOR 1K 1% .125W F TC =0+-100	24546	C4-1/8-T0-1001-F
R25	1810-0273	9	1	NETWORK-RES 10-SIP470.0 OHM X 9	01121	210A471
R26	0698-3155	1	1	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	CT4-1/8/T0-4641-F
S1	3101-2831	8	2	SWITCH 8P	28480	3101-2831
S2	3101-2831	8		SWITCH 8P	28480	3101-2831
U1	1818-3918	8	2	IC CMOS 262144 (256K) STAT RAM 120-NS	S4013	HM62256LP-12
U2	1818-3918	8		IC CMOS 262144 (256K) STAT RAM 120-NS	S4013	HM62256LP-12
U3	1990-1179	6	3	PHOTO-COUPLER	28480	1990-1179
U4	1990-1179	6		PHOTO-COUPLER	28480	1990-1179
U5	1990-1179	6		PHOTO-COUPLER	28480	1990-1179
U6	1990-0602	8	1	OPTO-ISOLATOR LED-IC GATE IF=20MA-MAX	28480	5082-4316
U7	1818-3801	1	2	IC NMOS 65536 (64K) ELEC-ER-PROM 300-NS	S4013	HN58064P-30
U8	1820-1208	3	2	IC GATE TTL LS OR QUAD 2-PIN	01295	SN74LS32N
U9	1820-4888	1	1	CMOS 6321P	28480	1820-4888
U10	1820-1208	3		IC GATE TTL LS OR QUAD 2-PIN	01295	SN74LS32N

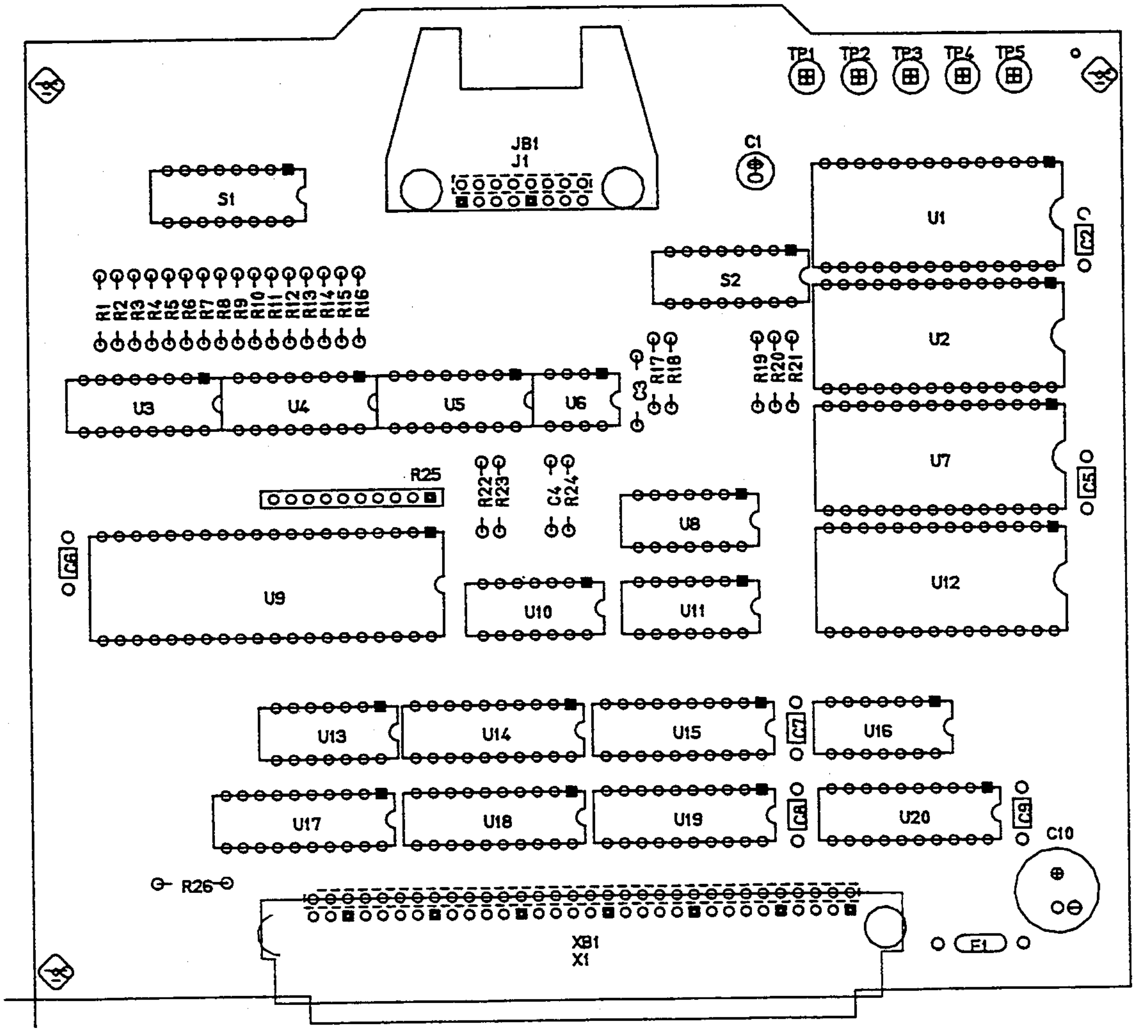
Table 4-A40-2. A40 Scanner Interface Replaceable Parts list (2/2)

Reference Designator	HP Part Number	C D	Qty.	Description	Mfr Code	Mfr Part Number
U11	1820-1112	8	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
U12	1818-3801	1	2	IC NMOS 65536 (64K) ELEC-ER-PROM 300-NS	S4013	HN58064P-30
U13	1820-1200	5	1	IC INV TTL LS HEX	01295	SN74LS05N
U14	1820-2075	4	5	IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U15	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U16	1820-1199	1	1	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
U17	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U18	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U19	1820-2075	4		IC TRANSCEIVER TTL LS BUS OCTL	01295	SN74LS245N
U20	04278-80004	0	1	PAL	28480	04278-80004
X1	1252-1598	9	1	CONN-POST TYPE 2.54-PIN-SPCG 96 CONT	09922	PI96B30P00F50N9
	4040-0748	3	1	EXTR-PC BD BLK POLYC .62-BD-THKNS	28480	4040-0748
	4040-0752	9	1	EXTR-PC BD YEL POLYC .062-IN-BD-THKNS	28480	4040-0752

NOTES

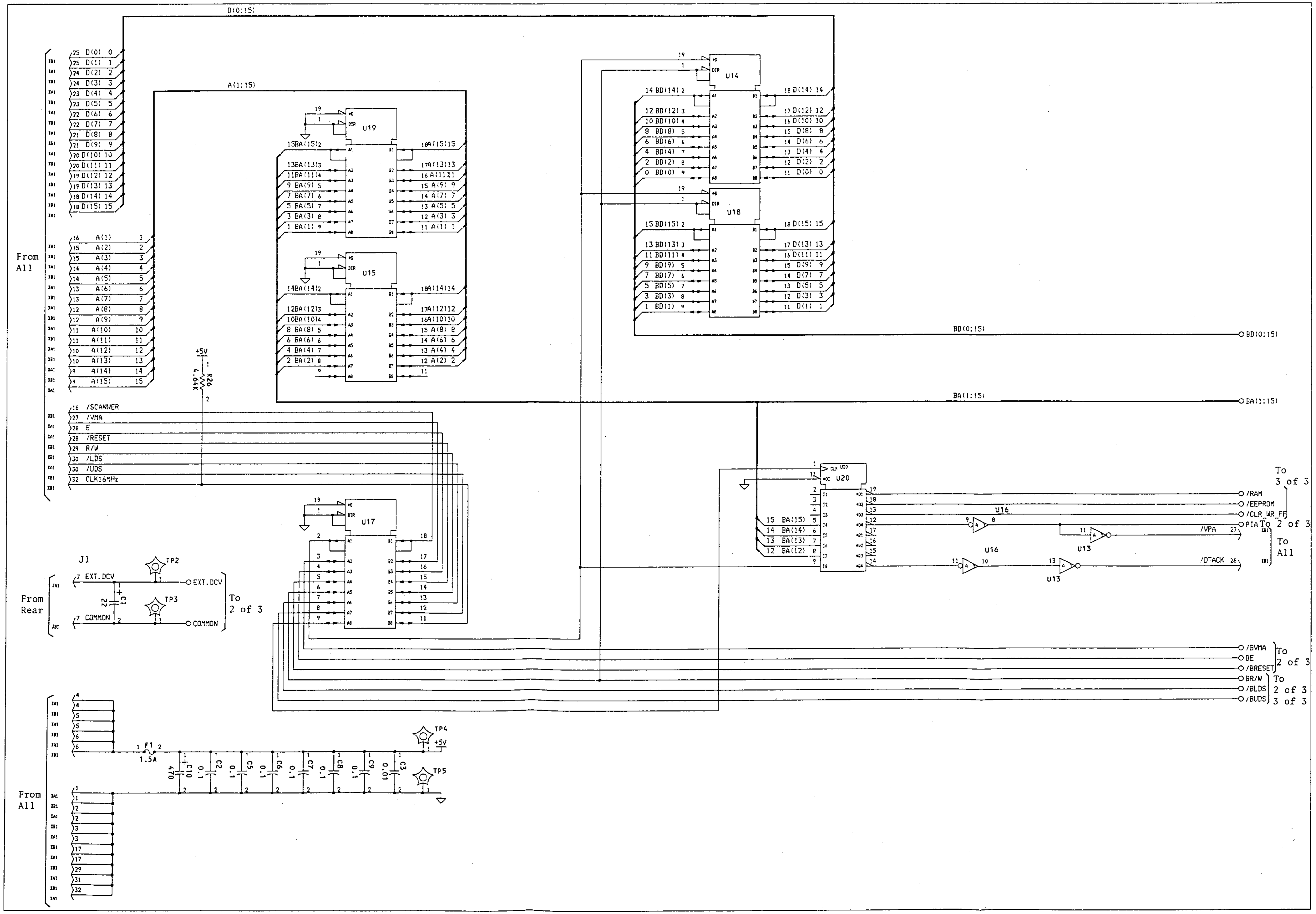
4:Service Sheets

A40J1B	Pin No.	A40J1A
nc	8	nc
COMMON	7	EXT.DCV
/EOM	6	/INDEX
EXT_TRIG	5	/CH_VALID
/CH7	4	/CH6
/CH5	3	/CH4
/CH3	2	/CH2
/CH1	1	/CH0



A40X1B	Pin No.	A40X1A
LGND	1	LGND
LGND	2	LGND
LGND	3	LGND
+5V	4	+5V
+5V	5	+5V
+5V	6	+5V
nc	7	nc
nc	8	nc
A14	9	A15
A12	10	A13
A10	11	A11
A8	12	A9
A6	13	A7
A4	14	A5
A2	15	A3
/SCANNER	16	A1
LGND	17	LGND
D14	18	D15
D12	19	D13
D10	20	D11
D8	21	D9
D6	22	D7
D4	23	D5
D2	24	D3
D0	25	D1
/DTACK	26	nc
/VPA	27	/VMA
/RESET	28	E
R/W	29	LGND
/UDS	30	/LDS
/KEY_LOCK_INT	31	/SCANNER_INT
/CLK16MHz	32	LGND

Figure 4-A40-1. A40 Scanner Interface Component Locations

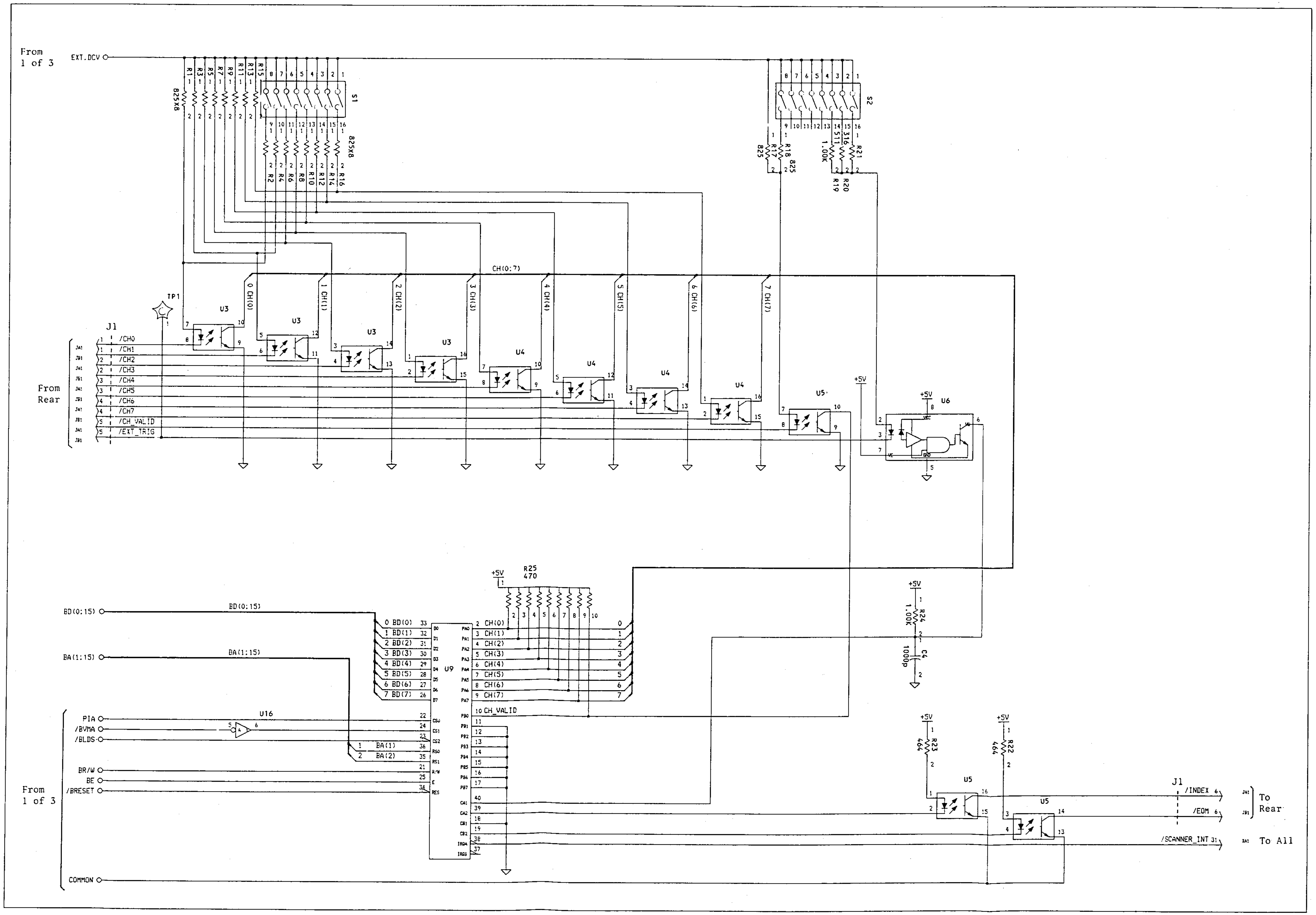


NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.
2. UNLESS OTHERWISE INDICATED:

   RESISTANCE IN OHMS (Ω)
   CAPACITANCE IN MICROFARADS (μF)
   INDUCTANCE IN MICROHENRIES (μH)

Figure 4-A40-2. A40 Scanner Interface Schematic Diagram. (1 of 3)



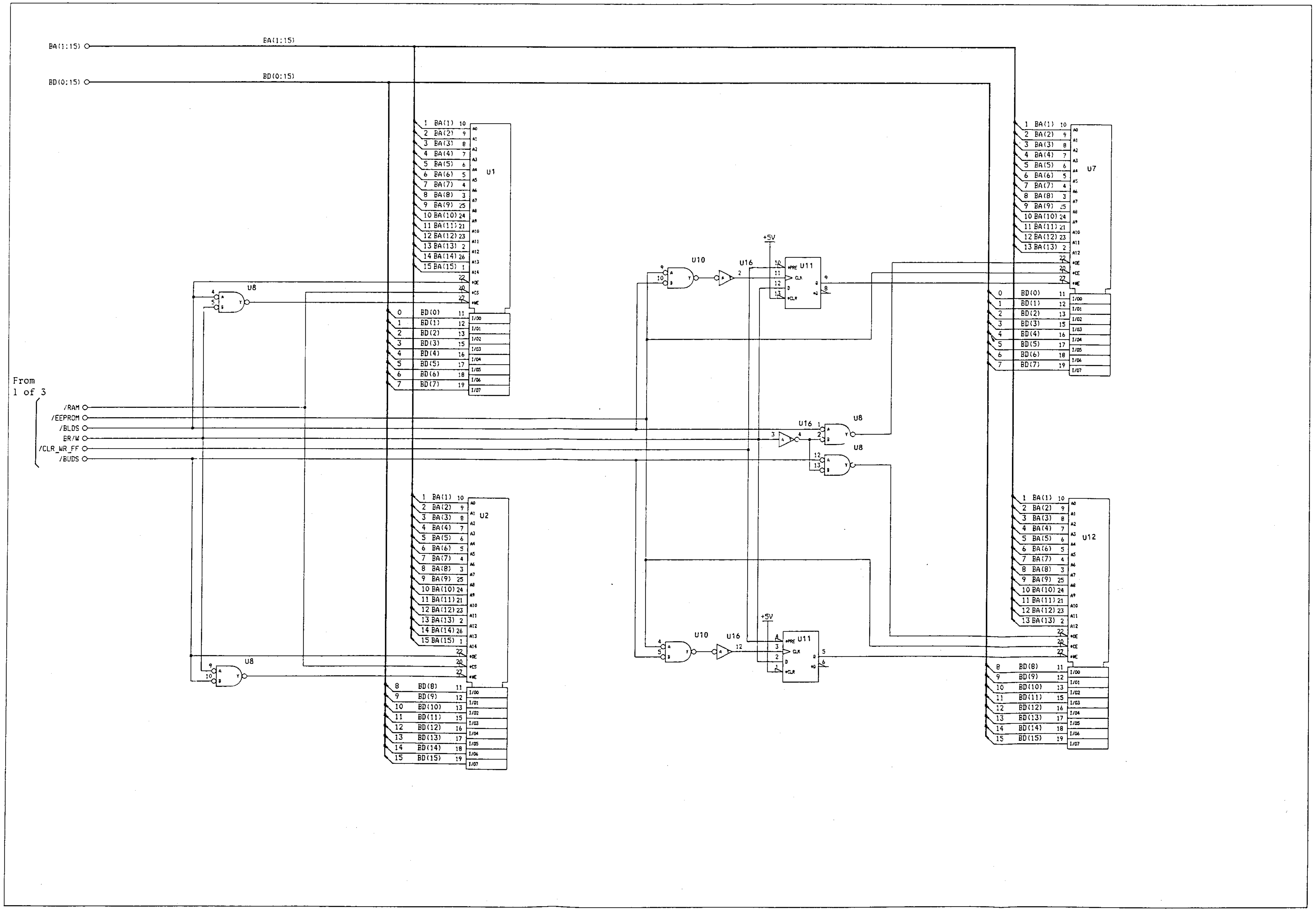
NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.

2. UNLESS OTHERWISE INDICATED:

   RESISTANCE IN OHMS (Ω)
   CAPACITANCE IN MICROFARADS (uF)
   INDUCTANCE IN MICROHENRIES (uH)

Figure 4-A40-2. A40 Scanner Interface Schematic Diagram. (2 of 3)



NOTES:

1. REFERENCE DESIGNATORS WITHIN THIS ASSEMBLY ARE ABBREVIATED. PREFIX ABBREVIATION WITH ASSEMBLY NUMBER FOR COMPLETE REFERENCE DESIGNATOR.

2. UNLESS OTHERWISE INDICATED:

RESISTANCE IN OHMS (Ω)
CAPACITANCE IN MICROFARADS (μF)
INDUCTANCE IN MICROHENRIES (μH)

Figure 4-A40-2. A40 Scanner Interface Schematic Diagram. (3 of 3)

APPENDIX A

MANUAL CHANGES

A-1.INTRODUCTION

This appendix contains the information required to adapt this manual to earlier versions or configurations of the HP 4284A than the current printing date of this manual. The information in this manual applies directly to HP 4284A Precision LCR Meters whose serial number prefix is listed on the title page of this manual.

A-2. MANUAL CHANGES

To adapt this manual to your HP 4284A, refer to Tables A and B, and make all of the manual changes listed opposite your instrument's serial number and ROM-based firmware's version.

Instruments manufactured after the printing of this manual may be different than those documented in this manual. Later instrument versions will be documented in a manual changes supplement that will accompany the manual shipped with that instrument. If your instrument serial number is not listed on the title page of this manual or in Table A, it may be documented in a **yellow MANUAL CHANGES** supplement.

Refer to the description of the *IDN? command in **SECTION 8, COMMAND REFERENCE, OPERATION MANUAL** for confirmation of the ROM-based firmware's version. For additional information on serial number coverage, refer to **SECTION 1.**

Table A. Manual Changes by Serial Number

Serial Prefix or Number	Make Manual Changes
	There are no earlier configurations than the printing date of this manual.

Table B. Manual Changes by Firmware's Version

Version	Make Manual Changes
	There are no earlier versions than the printing date of this manual.

NOTES

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